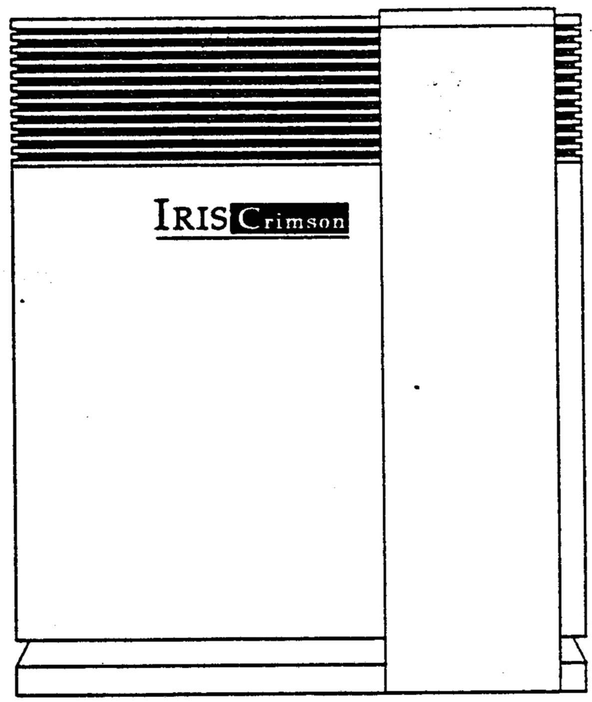
Field Service Handbook

for Silicon Graphics Workstations

Crimson™



Great Eastern
TECHNOLOGY

Field Service Handbook

Crimson Workstations

Great Eastern
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Section 1—Specifications

This section includes the following information about Crimson systems:

- Product description
- Models
- Environmental and physical specifications

Product Description

Introduced in 1992, Crimson systems are Silicon Graphics' mid-range product offering. These systems are configured with either a MIPS R4000 or R4400 microprocessor, which is configured on a single-processor CPU board. Crimson systems support seven different graphics subsystems, many which are used on other models of SGI workstations.

Crimson systems are configured in a single tower chassis, similar to the chassis used by SGI POWER Series systems.

Features

Crimson systems feature the following:

Microprocessors .... MIPS 100 MHz R4000
MIPS 150 MHz R4400

Memory .... 16 to 256 MB
32 SIMM slots
Uses 2 or 8 MB SIMMs

Graphics subsystems .... Entry
XS
XS24
Elan
Extreme
VGXT
Reality Engine (RE)

I/O .... VME I/O bus; four VME slots

Mass storage .... Two 5.25" full-height drive bays
Two 5.25" half-height drive bays

Network connections .... Ethernet AUI

Operating system .... IRIX (System V, with BSD 4.3 enhancements)
Minimum Supported Revision: IRIX 4.0.3
Latest revision: IRIX 5.2

Models

Crimson Series systems are configured in a number of models based on the processor speed (most systems come standard with R4000 microprocessor), installed memory (16 or 64 MB standard), and graphics subsystem. Crimson systems are also configured as network servers (without a graphics subsystems).

The section below lists the model numbers for standard configurations of systems based on the amount of installed memory. All Crimson systems are shipped with a 1.2 GB disk drive.

Note: The "W6" in the following model numbers denote the single tower chassis in which Crimson systems are configured.

Systems configured with 16 MB of low-density memory

Model Number	Processor	Graphics Subsystem
W6-CRIMS	R4000	None (server)
W6-CRIMBLG	R4000	Entry
W6-CRIMXS	R4000	XS
W6-CRIMXS24	R4000	XS24
W6-CRIMEG	R4000	Elan
W6-CRIMEX	R4000	Extreme
W6-CRIMRE	R4000	Reality Engine
W6-JUR16VGXT*	R4400	VGXT

***Note:** Before July 1994, this configuration was called the "Jurassic Classic" (model number W6-JUR16VGXT).

Systems configured with 64 MB of high-density memory

Model Number	Processor	Graphics Subsystem
W6-4DCR64S	R4000	None (server)
W6-4DCR64BLG	R4000	Entry
W6-4DCR64XS	R4000	XS
W6-4DCR64XS24	R4000	XS24
W6-4DCR64EG	R4000	Elan
W6-4DCR64EX	R4000	Extreme
W6-4DCR64RE	R4000	Reality Engine
W6-CRIM150VGXT*	R4400	VGXT
W6-CRIM150RE	R4400	Reality Engine

***Note:** Before July 1994, this configuration was called the "Jurassic Classic" (model number W6-JUR64VGXT).

Environmental/Physical Specifications

This section contains environmental and physical specifications for Crimson systems, which are configured in a single tower chassis.

Environmental/Physical Specifications

Operating temperature .... 50 to 95°F (10 to 35°C)

Storage temperature .... -40 to 141°F (-40 to 60°C)

Size and Weight

Chassis .... Width—21" (54cm)
Height—26" (65 cm)
Depth—29" (74 cm)
Weight—180 lbs (82 kg)

19" Monitor .... Width—19.2" (49 cm)
Height—21.5" (54.5 cm)
Depth—19.4" (49 cm)
Weight—68 lbs (31 kg)

16" Monitor .... Width—15.5" (39 cm)
Height—16" (41 cm)
Depth—17" (43 cm)
Weight—47 lbs (21 kg)

Keyboard .... Width—20" (51 cm)
Height—1.75" (4.5 cm)
Depth—8.5" (21.5 cm)
Weight—3 lbs (1.4 kg)

Power

Line voltage	104–132 VAC 200–240 VAC
Current	System—20 amps at 120 VAC 10 amps at 240 VAC Monitor—2.5 amps at 120VAC
AC frequency range	47 to 63 Hz
Input plug type	NEMA 5-20
Heat displacement	System—2600 BTUs typical (maximin of 4100 BTUs/hour) Monitor—512 BTUs/hour

Audio Noise

Maximum 85db (typical operation)

Section 2—Configurations

This section contains the following configuration information for Crimson systems:

- Chassis configuration
- Slot assignments
- Component location and jumpering for CPU board
- Memory
- IO3B I/O controller
- Graphics subsystems
  - Entry
  - XS
  - XS24
  - Elan
  - Extreme (EX)
  - VGXT
  - Reality Engine (RE)
- Monitors
- Supported peripheral devices

Displaying the System Configuration

Use the **hinv** (hardware inventory) command to display a list of hardware configured in the system. Execute the **hinv** command from the Command Monitor (see Section 3, page 3-3) or from the IRIX system prompt.

To display a hardware configuration list:

- At the IRIX system prompt or the Command Monitor prompt, enter **hinv**.

  The system displays a list similar to the following:

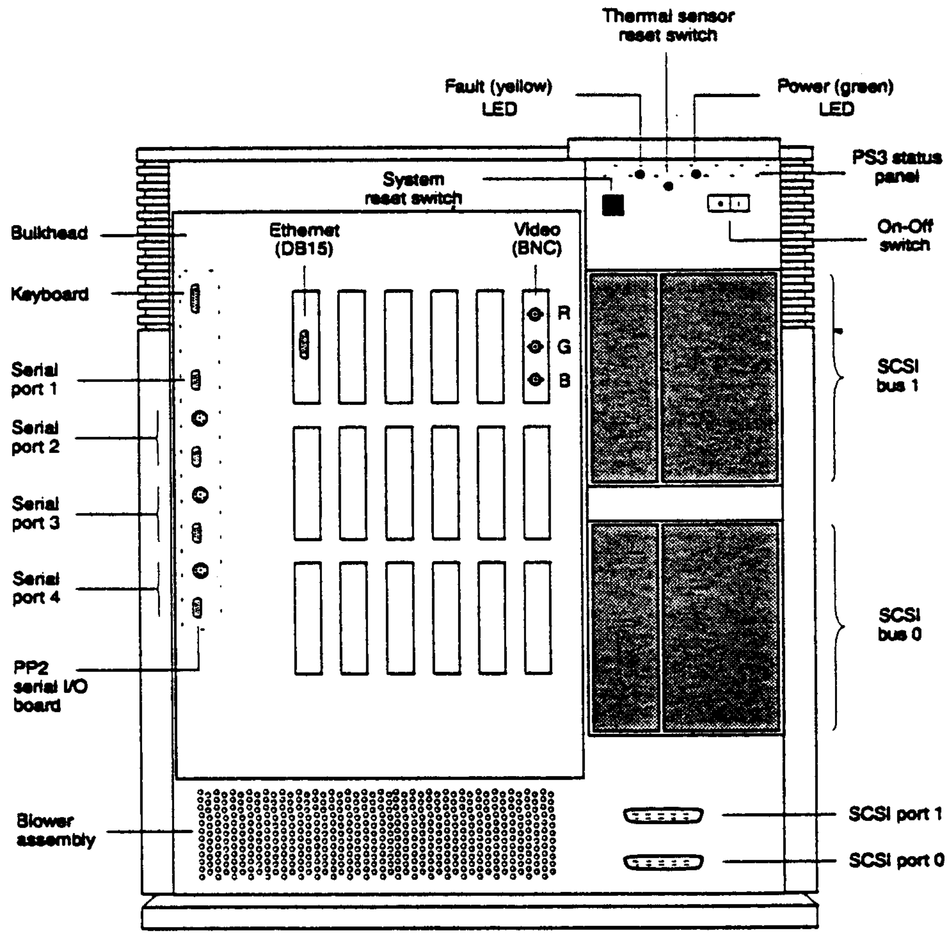
```
1 50 MHZ IP17 Processor
FPU: MIPS R4010 Floating Point Chip Revision: 0.0
CPU: MIPS R4000 Processor Chip Revision: 2.2
On-board serial ports: 4
Data cache size: 8 Kbytes
Instruction cache size: 8 Kbytes
Secondary unified instruction/data cache size: 1 Mbyte
Main memory size: 32 Mbytes
I/O board, slot F: IO3B
Integral Ethernet: et0, IO3
Tape drive: unit 6 on SCSI controller 1: DAT
Integral SCSI controller 1: Version WD33C93A, revision 9
CDROM: unit 6 on SCSI controller 0
Disk drive: unit 1 on SCSI controller 0
Integral SCSI controller 0: Version WD33C93A, revision 9
Graphics board: GR2-Elan
```


Chassis Configurations

Crimson systems are configured in a single tower deskside chassis, which is the same single tower chassis supported by POWER Series systems.

- 14-slot deskside chassis
- Front loading 9U VME card cage
- Four front-loading drive bays
  - Two 5.25" half-height drive bays
  - Two 5.25" full-height drive bays
- Status Panel
  - On-off switch
  - System reset switch
  - Power LED (green)
  - Fault LED (yellow)
  - Thermal sensor reset switch
- Front access to cabling
- Blower assembly (located at bottom of chassis)
- 1050W power supply

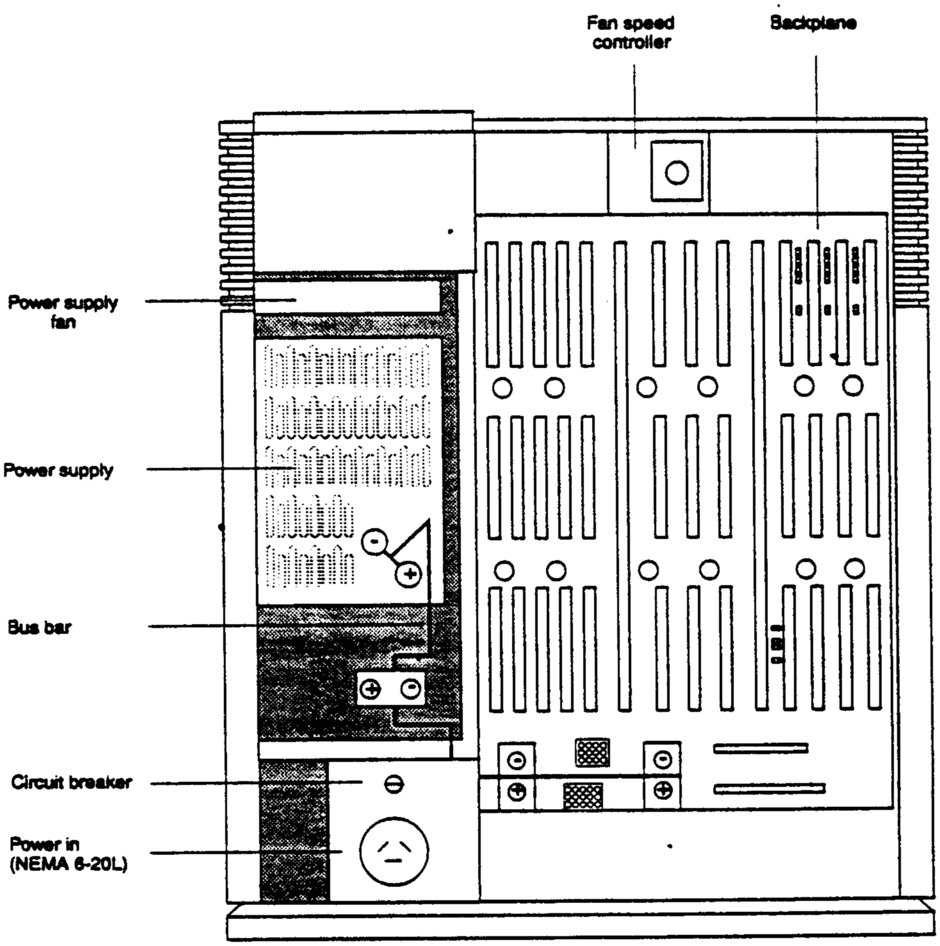
Chassis—Front View (without cover)



Chassis (Front View)—Comments

1. Fault and power LEDs, on-off switch, system reset switch, and thermal sensor reset switch reside on the PS3 status panel PCA (see page 2-10), located behind status panel plate.
2. Power LED remains lit after system is powered-on; indicates normal DC power.
3. Fault (yellow) LED is lit and steady during power-on self tests (POSTs). After system passes its POSTs, fault LED goes out.
4. If system fails its POSTs, fault LED remains lit.
5. PS3 status panel PCA contains a one-digit hex status display, which displays the following:
   - During power-up, displays steady "F"
   - After system passes its POSTs and goes into the PROM Monitor (System Maintenance Menu), alternately displays "1" and "2"
   - After system boots IRIX, alternately displays "0" and "1"
6. Mode DIP switches also reside on the PS3 PCA and can be configured to run different kinds of diagnostics modes during power-up. For normal operation, all switches are set to "ON". See page 2-11 for setting switches to by-pass POSTs.
7. Thermal reset switch resets thermal sensor, which is located in the top of the single tower chassis.
8. Thermal sensor (circuit breaker) located in top of system tower; system is shut down if temperature exceeds 140 °F (60 °C). Thermal sensor can be reset after system temperature cools to 104 °F (40 °C).
9. System support four front-loading 5.25" devices.
   - Two half-height drive bays
   - Two full-height drive bays
10. Full-height drive bays can be configured with full or half-height devices.
11. Devices in top drive bays reside on SCSI bus 1; devices in bottom drive bays reside on SCSI bus 0.
12. Terminate SCSI buses (0 and 1) using a terminator connected to SCSI ports.
13. SCSI buses can be extended to external devices using SCSI ports.
14. Systems with three BNC connectors sync on green.
15. Keyboard port serial ports reside on PP2 serial I/O board.
16. Serial ports 2, 3, and 4 have DB9 and 8-pin DIN connectors, which share wiring. For these serial ports, only one connector at a time can be used.

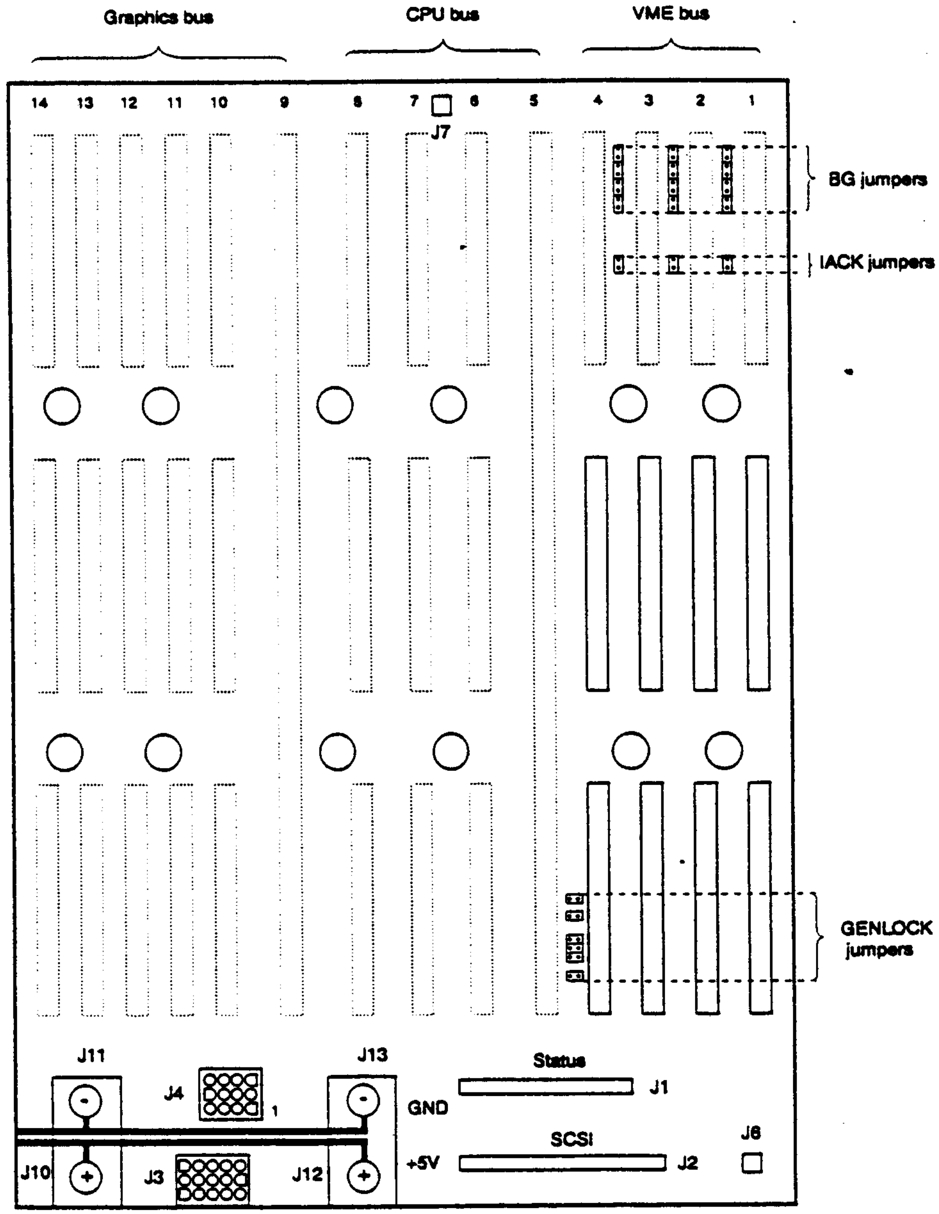
Chassis—Rear View (without cover)



Chassis Rear View—Comments

1. Power supply circuit breaker controls input power to power supply.
2. Power bus bar connects +/- 5V from power supply to backplane.
3. Power supply fan configured with power supply assembly.
4. See page 3-33 for procedures describing how to check power supply voltages.

Chassis—Backplane (rear view)

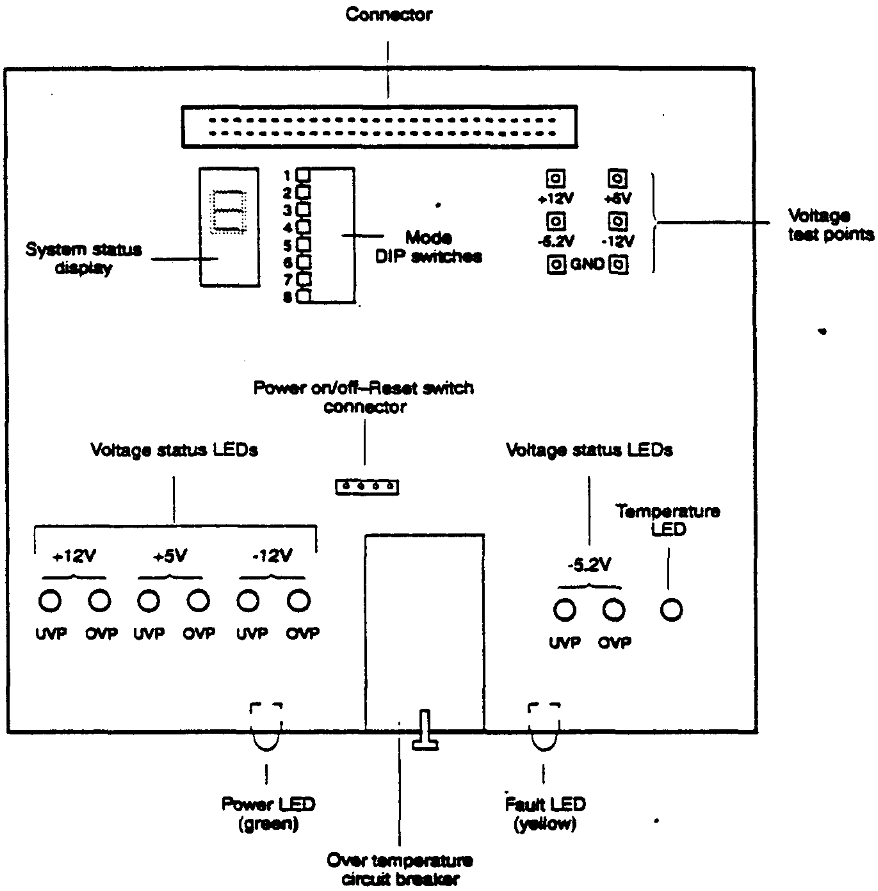


Backplane—Comments

1. The Crimson system uses a multi-processor systems backplane (FRU# 030-0197-00x).
2. Remove rear cover and backplane cover to access the backplane.
3. Backplane slots comprise the following buses:
   - Slots 1–4 = VME bus
   - Slots 5–8 = CPU bus (I/O—CPU)
   - Slots 9–14 = Graphics bus

   For slot assignments, see page 2-13.
4. As a general guideline, populate the VME slots from slot 1 to slot 4.
5. Jumpers located between VME slots (1–4) are bus grant (BG) and interrupt acknowledge (IACK) jumpers. Use the following rules when jumpering the VME slots:
   - If any VME slot is empty, BG and IACK jumpers located to the left of the empty slot must be installed.
   - If a board is installed in a VME slot, the jumpers for that slot must be removed.
6. If the GENLOCK board is installed in a VME slot, it must reside in slot 4 and the GENLOCK jumpers (located to the left of bottom connector for slot 4) must be installed.
7. The top power bus bar connects ground from power supply to backplane at locations J11and J13.
8. The bottom power bus bar connects +5V from power supply to backplane at locations J10 and J12.
9. The connectors on the backplane provide connections to the following system components:
   - J1—Connects backplane to the PS3 PCA, located behind status panel.
   - J2—Connects backplane to SCSI bus drive bays.
   - J3—Supplies all power supply voltages to backplane.
   - J4—Supplies power to PP2 serial I/O board, located on system bulkhead.
   - J6—Supplies power to cooling fans (connects to fan speed controller, located on backplane).
   - J7—Connects to thermal sensor located in the top of the chassis.

Chassis—PS3 Status Panel PCA



PS3—Comments

1. The PS3 displays status information about the system; it also can be configured to assist in troubleshooting system problems.
2. To view the system status display or voltage LEDs, set the mode DIP switches, or use the voltage test points, you must remove the PS3 board from the chassis. To remove the PS3:
   - Remove any devices in the top two drive bays.
   - Remove the screw holding the PS3 status panel assembly into the chassis.

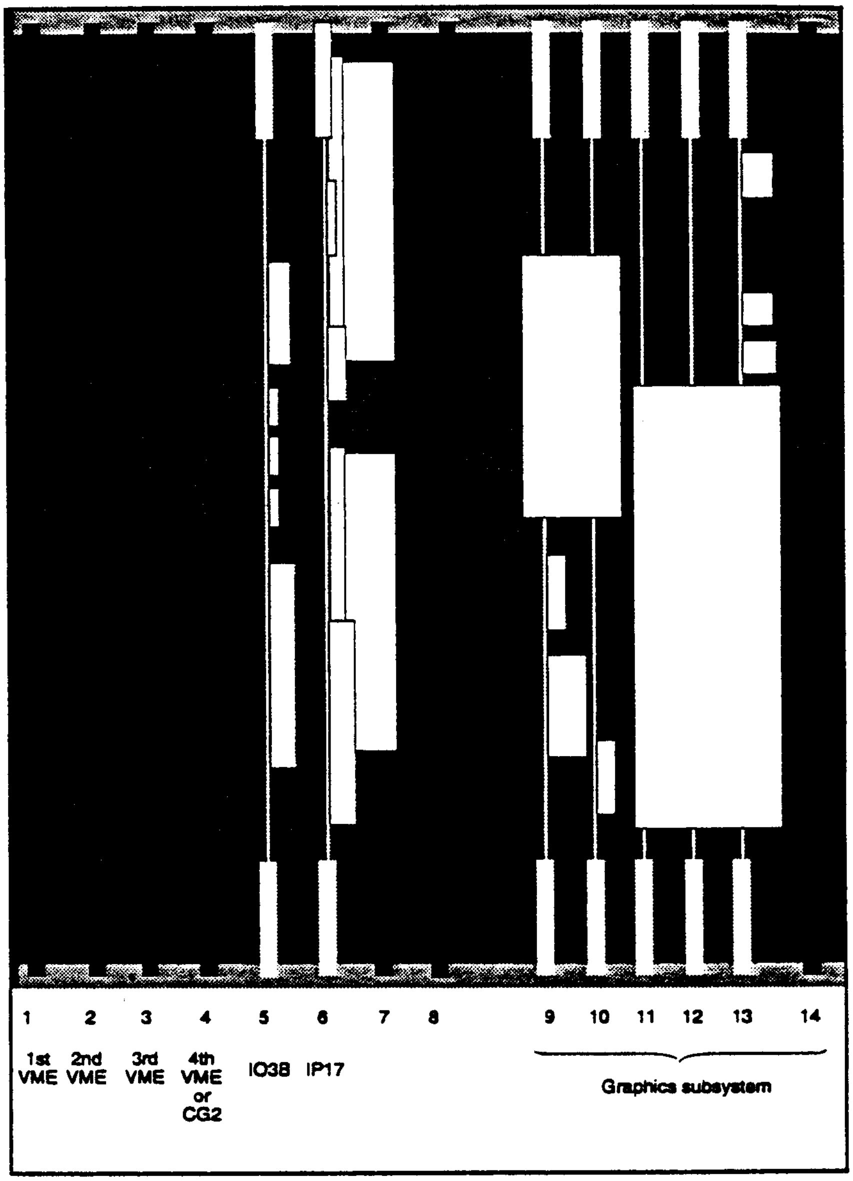
   Warning: When the PS3 is not installed in the chassis and the system is powered-on, be careful not to short out the PS3.
3. A ribbon cable connects the PS3 status panel to the connector at location J1 on the system backplane (see page 2-8).

4. System power switch is used to turn power on and off to the system.
5. System status LEDs—Two system status LEDs provide system status information.
   - Power LED (green)—Lit when system is powered on and the system's DC power supply is normal.
   - Fault LED (yellow)—Lit when system is powered on and while the POSTs are running; fault LED goes out when system passes its POSTs and enters the PROM Monitor or boots the operating system. If the system fails a POST, fault LED remains lit.
6. Thermal circuit breaker—Trips when the system air temperature exceeds 140°F (60 °C). The breaker cannot be reset until the system temperature cools to 104 °F (40 °C). The breaker will also trip if the system senses a DC voltage that is 40% out of range.
7. System reset Switch—Performs a hardware reset (power cycle); use only when all other means of getting control of the system have been tried.

   Note: If the system is running IRIX, wait at least two minutes before resetting the system to give IRIX a chance to sync the disk.
8. Mode DIP switches—Selects the following modes in which the CPU can run; use different modes for troubleshooting the system.

   Note: When in the ON position, a DIP switches is down, closest to the PCA board.
   - **Normal**—All switches ON. In normal mode, the system runs all POSTs; if a fault is not detected, the system will boot or enter into the PROM Monitor.
   - **Power-on**—Switches 1 and 8 OFF. In power-on mode, the system runs all POSTs and then forces the system into the Power ON (PON) mode.
   - **POST bypass**—Switches 3 and 8 OFF. In POST bypass mode, the system bypasses all POSTs excepted the first memory test, and attempts to enter the PROM Monitor on serial port 1.
9. System status display—A one digit hex LED display, which displays the following digits:
   - Solid F during POSTs.
   - Solid F remains displayed is system fails a POST.
   - Alternating 1's and 2's while system is in the PROM Monitor.
   - Alternating 0's and 1 when the system is running IRIX.
10. Voltage status LEDs—Voltage status LEDs illuminate when a specific voltage is either 10% over the normal range (OVP) or 10% under the normal range (UVP); see illustration on previous page for location of LEDs corresponding to specific voltages.
11. Temperature status—Illuminates when the chassis temperature is too high.

Chassis—Card Cage



Chassis—Slot Assignments

The following table lists the slot assignments for the single tower chassis.

Slot	Board
1	1st VME
2	2nd VME
3	3rd VME
4	4th VME or CG2 GENLOCK video
5	IO3B
6	IP17 CPU
7	Empty
8	Empty
9	Graphics (single-board graphics subsystems)
10	Graphics
11	Graphics
12	Graphics
13	Graphics
14	Graphics

Slot Assignments for Graphics Subsystems

For single tower slot assignments for multiple-board graphics subsystems, see the following pages:

- VGXT—page 2-33
- Reality Engine—page 2-34

Slot Assignments—Comments

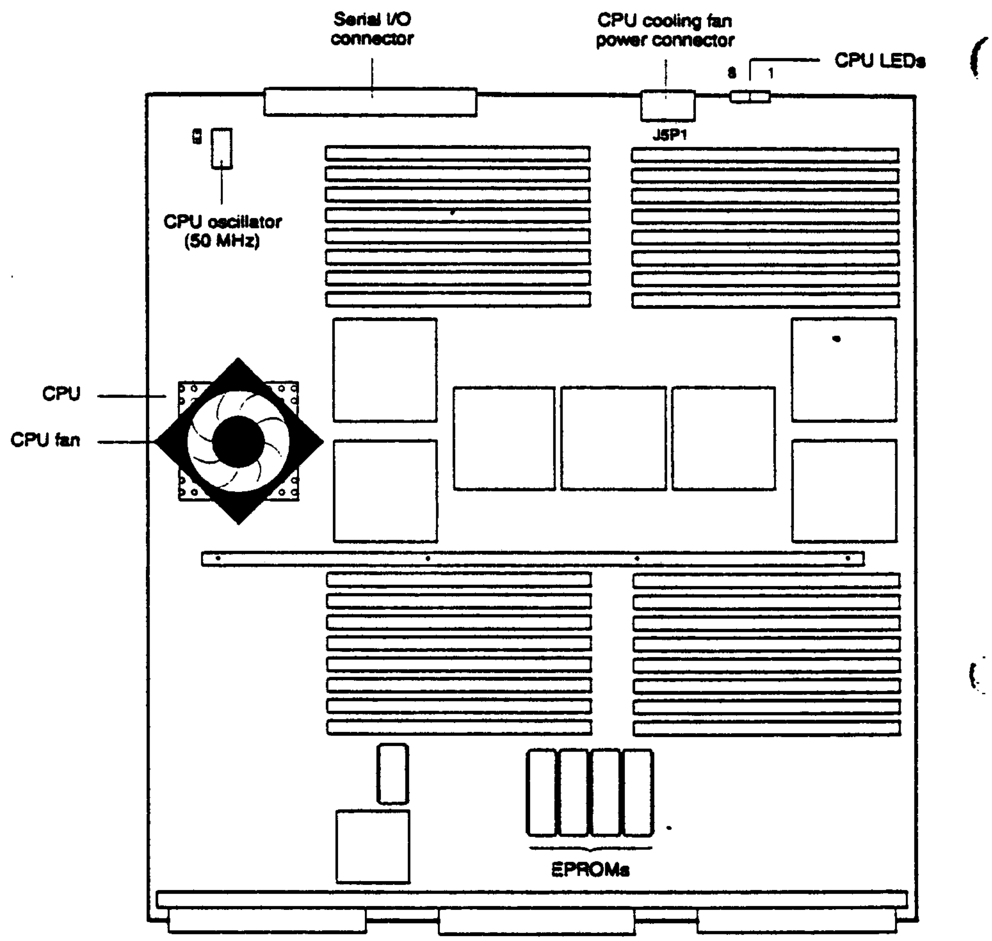
1. See table on previous page for slot assignments.
2. Card cage is located behind the system bulkhead.
3. Configure VME controller boards in slots 1–4
   - Install VME boards beginning with slot 1.
   - There must be either a board installed in a slot or jumpers installed between the beginning of the VME backplane and the last VME board (see page 2-8 for jumper locations).
   - Slot 4 may contain either a VME board or a CG2 genlock video board.
4. The IO3B must be install into slot 5.
5. The Crimson CPU board must be installed into slot 6.
6. The IP17 Crimson CPU can not run with MC2 memory board.
7. Single-board graphics subsystems reside in slot 9.
8. Boards comprising the VGXT and Reality Engine graphics subsystem are installed in slots 9–14.

CPU Board

Crimson systems are configured with a single-processor IP17 CPU board, which is configured with two different MIPS microprocessors. The microprocessor is permanently mounted on the CPU board.

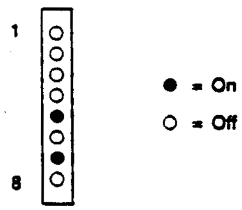
- **100 MHz R4000**
  - 16 K primary cache (8 K data/8 K instruction)
  - 1 MB secondary cache
- **150 MHz R4400**
  - 32 K primary cache (16 K data/16 K instruction)
  - 1 MB secondary cache

CPU—IP17 Component Locations

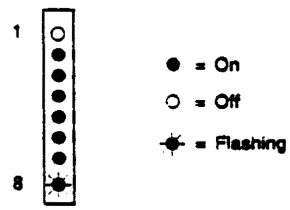


IP17—Comments

1. The IP17 CPU resides in slot 6.
2. Because the MIPS R4x00 microprocessor runs extremely hot, a heat sink and cooling fan are mounted directly on the microprocessor.
3. CPU cooling fan connects to cooling fan power connector at location J5P1.
4. The IP17 must run with a IO3B I/O controller.
5. Serial I/O connector connects CPU board to PP2 serial I/O panel (containing keyboard, mouse, and serial ports), which is mounted on system bulkhead (see page 2-4).
6. When the system is powered-on or reset, the LEDs on the IP17 cycle through the POSTs. After the system passes its POST and displays the System Maintenance Menu, the LEDs display the following pattern:



7. After the system has boot the IRIX operating system, the CPU LEDs display the following pattern during normal operation:

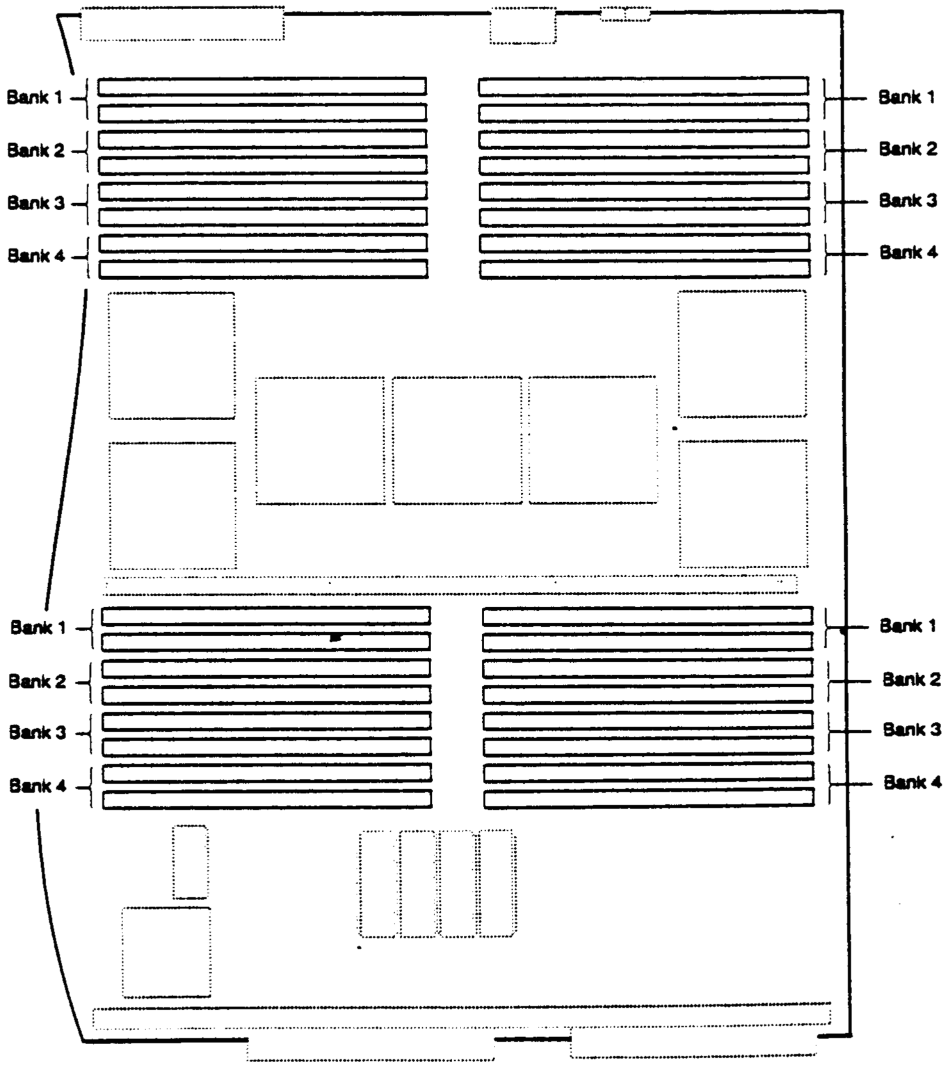


Memory

Crimson systems use 80ns, 72-pin single in-line memory modules (SIMMs), which reside on the IP17 CPU board. These SIMMs provide error correction checking (ECC) funtionality.

- 32 slots, physically organized in four groups of eight slots.
- Slots are logically organized in to banks; each bank consists of two SIMM slots.
- Each group of slots consists of banks 1 – 4.
- Systems support 2 MB (low-density) and 8 MB (high-density) SIMMs.

Note: Crimson systems use the same SIMMs used in POWER Series systems.

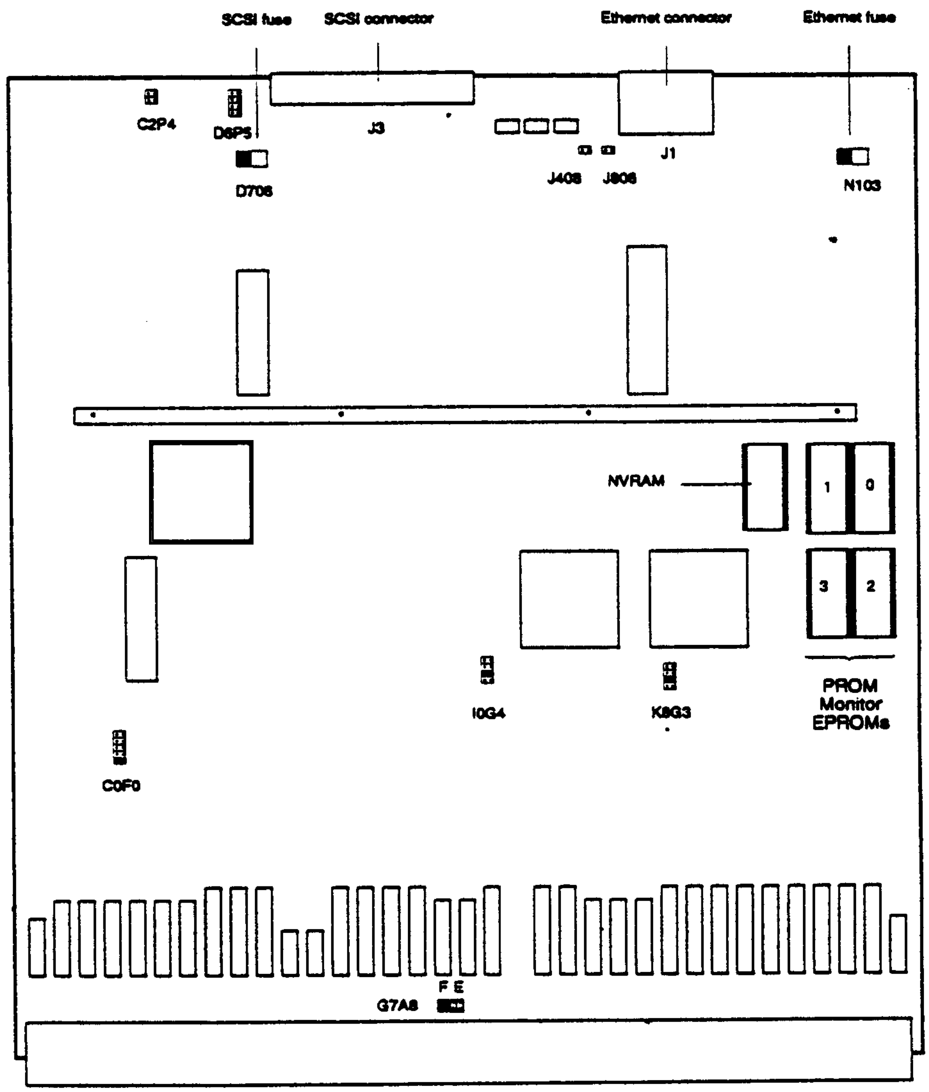


Memory—Rules for Populating Memory Slots

1. Install eight SIMMs at a time, populating all slots that comprise a bank.
2. Populate consecutive banks, beginning with bank 1 and ending with bank 4.
3. To mix 2 MB and 8 MB SIMMs on an IP17 CPU board, follow these rules:
   - Populate a bank with the same-capacity SIMMs.
   - Install 8 MB SIMMs in the lowest numbered banks

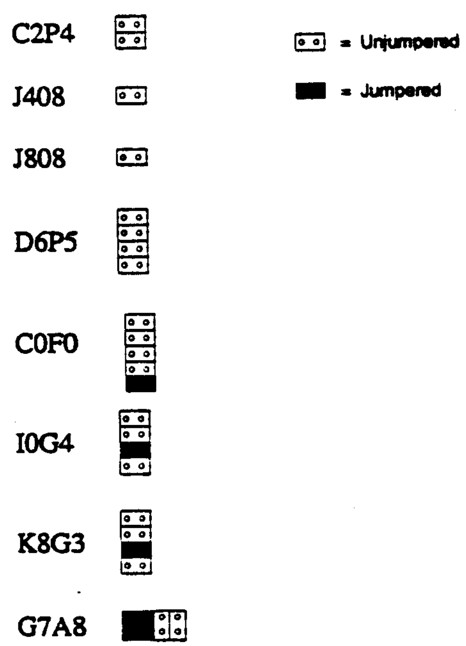
I/O Board

IO3B Component Locations



IO3B—Comments

1. The IO3B board resides in slot 5.
2. The IO3B has two SCSI controllers on-board.
3. The IO3B has one Ethernet control on-board.
4. For Ethernet and SCSI fuses, use a 2A 125V replacement fuse.
5. Both SCSI controllers use the same fuse.
6. The PROM Monitor logic resides on EPROMs on the IO3B.
7. The connector at location J3 is the connector for the second SCSI controller (SCSI bus 1).
8. The NVRAM chips holds the PROM Monitor environmental variables, including the PROM Monitor password and the Ethernet address.
9. For normal operation, use the following settings for IO3B jumpers:



Graphics Subsystems

Crimson systems can be configured with seven different graphics subsystems:

- Entry
- XS
- XS24
- Elan
- Extreme (EX)
- VGXT
- Reality Engine (RE)

Note: The Entry, XS, XS24, and Elan graphics subsystems consist of the same field replaceable units (FRUs) as the graphics supported by Indigo systems. The Extreme graphics subsystem consists of the same FRUs supported by Indigo^2 EX systems.

In both cases, adapters are required to configure these graphics subsystems in a Crimson chassis.

Single-Board Graphics Subsystems

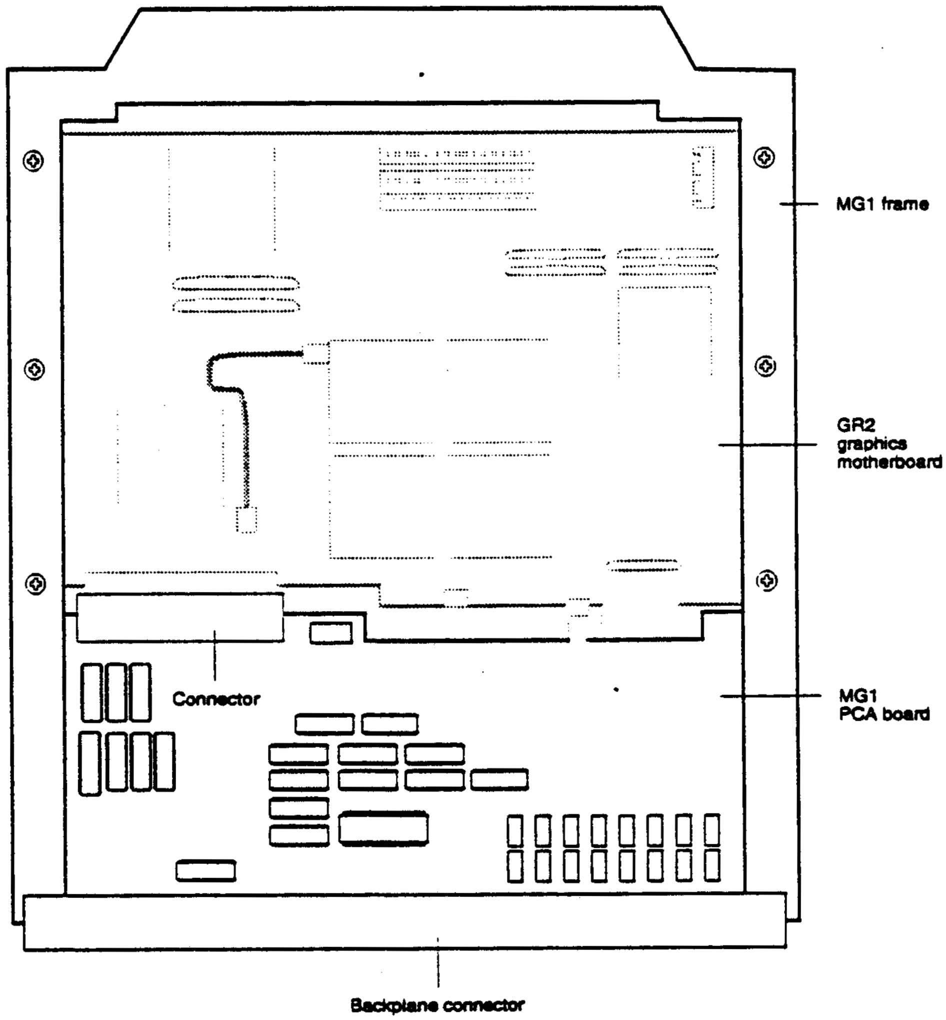
The Entry, XS, XS24, Elan, and EX graphics subsystems can be considered "single-board" graphics subsystems because they consume one slot in the Crimson chassis. However, these graphics subsystems consist of a motherboard, daughter cards, and adapter(s).

Multiple-Board Graphics Subsystems

The VGXT and RE graphics subsystems consist of three to five graphics boards. Boards in these subsystems have a 9U VME format, and each board consumes a different slot in the Crimson chassis.

Graphics—MG1 Adapter

The MG1 VME adapter adapts single-board graphic subsystems to the Crimson's 9U VME format. The graphics subsystem fits into the MG1 frame and connects to the connector on the MG1 PCA board, which also contains logic ASICs that enable the single-boards graphics subsystems to run in the Crimson.

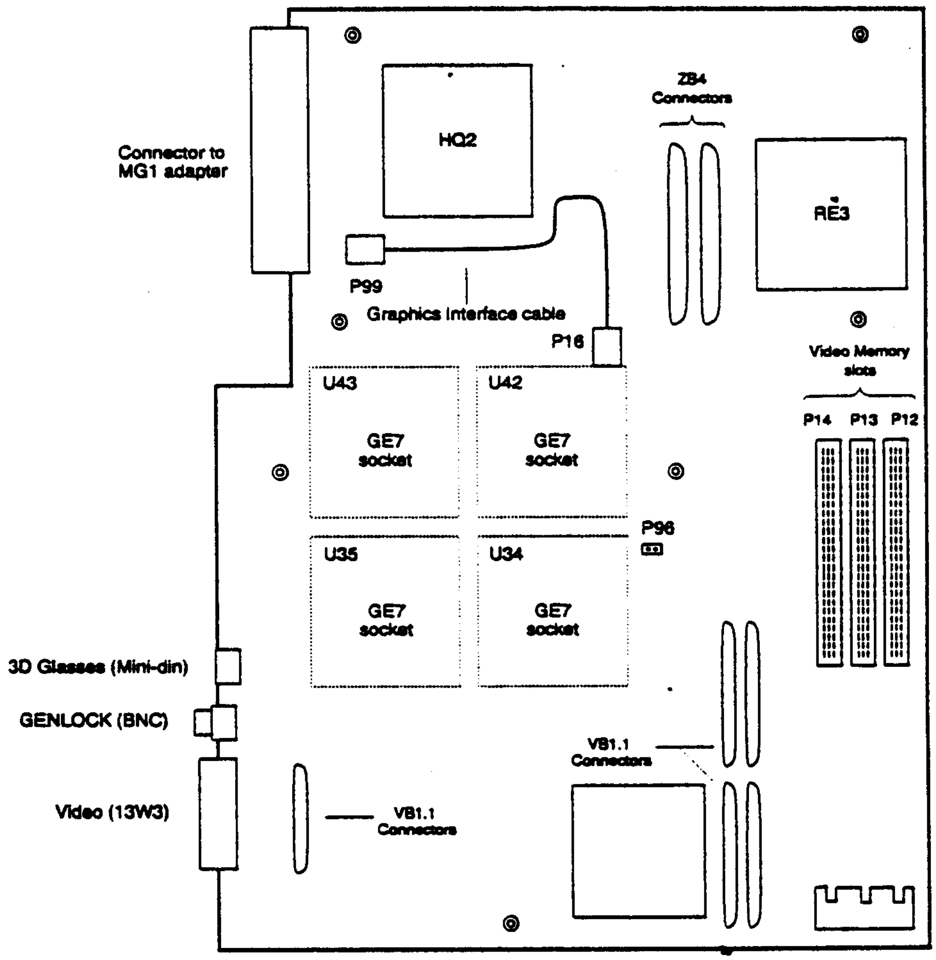


Comments

1. The MG1 is required to adapt all single-board graphics subsystems (Entry, XS, XS24, Elan, and EX) to a Crimson chassis.
2. The video cable for single-board graphics subsystems connects the subsystem to a 13W3 connector mounted on the system bulkhead at the front of the chassis.
3. Any ejector clips on an LG2 or GR2 board must be removed before those boards can be installed in the MG1 adapter.

Graphics—GR2 Motherboard

The XS, XS24, and Elan graphics subsystems are configured with a GR2 graphics motherboard. The GR2 can be configured with one or four GE7 Geometry Engines and one or three VM2 video memory modules. Different graphics subsystems will be configured with different quantities of GE7s and VM2s.



GR2—Comments

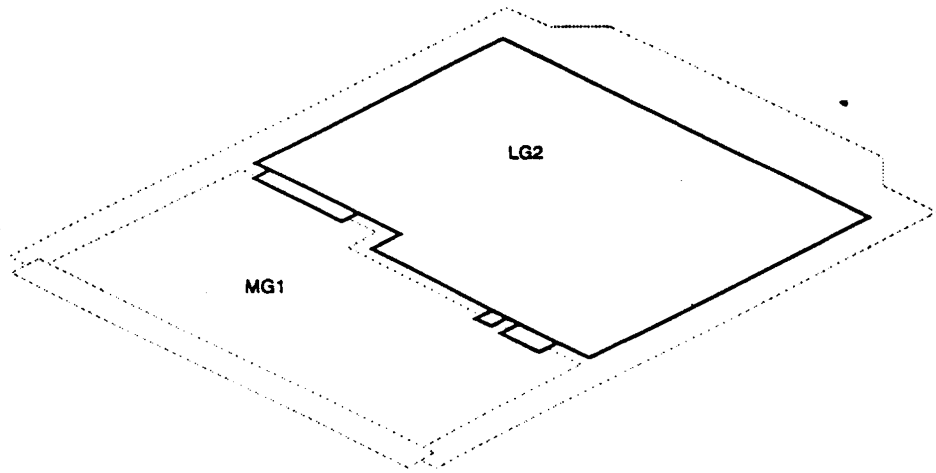
1. GE7 Geometry Engines are removable ASICs; however, GE7 ASICs are not field replaceable.
2. VM2 video memory modules reside in locations P14, P13, and P12.
3. In graphic subsystems configured with one VM2 memory module, the VM2 must reside in location P14.
4. For normal operation, jumper at location P96 must be installed (jumper is used for manufacturing testing).
5. If using a GR2 graphics motherboard from an Indigo, the ejector clips must be removed before installing the GR2 into the MG1 adapter.

Graphics—Entry

The 8-bit Entry graphics subsystem is configured with the following boards:

- LG2 graphic board
- MG1 VME adapter

The LG2 board contains a 13W3 video connector and a 15-pin composite video connector.



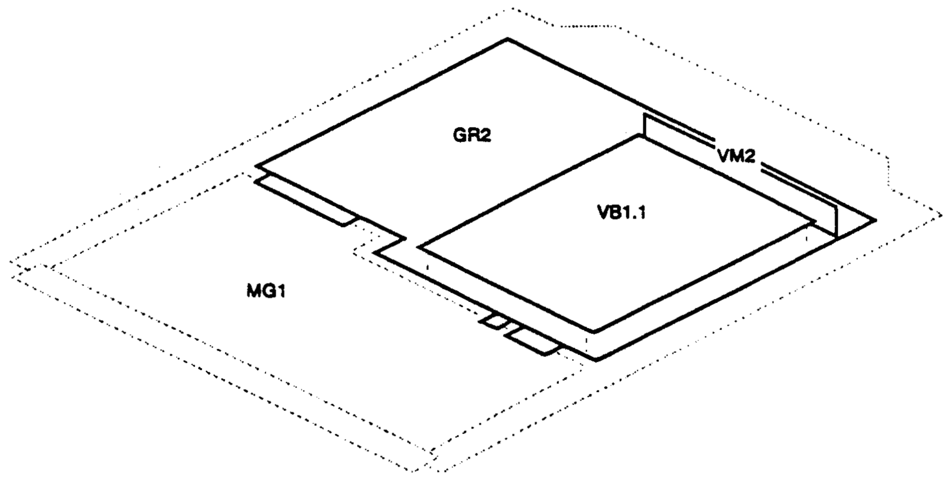
Comments

1. Resides in slot 9.
2. If using an LG2 from an Indigo system, the ejector clips must be removed to installed LG2 into MG1 adapter.

Graphics—XS

The 8-bit XS graphics subsystem consists of the following:

- GR2 graphics motherboard
  - Configured with one GE7 Geometry Engine
- OneVM2 8-bit video memory module
- VB1.1 Video Buffer daughter card
- MG1 VME adapter



Comments

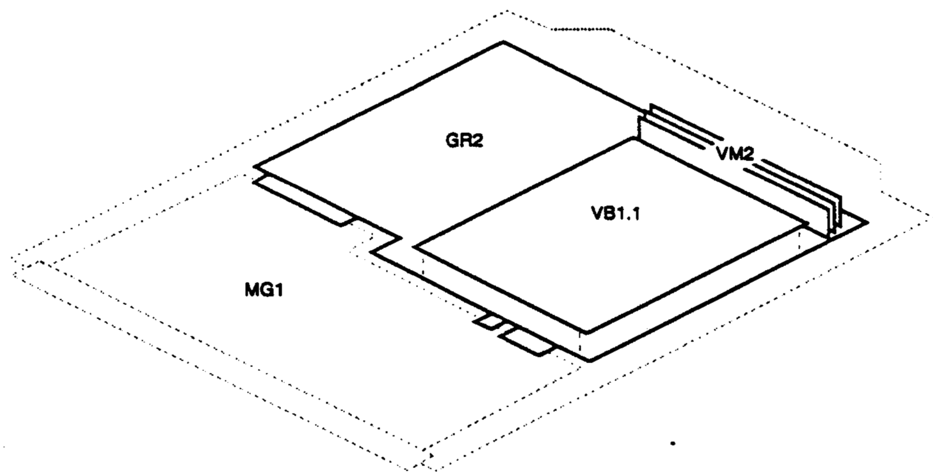
1. The XS graphics subsystem resides in slot 9.
2. The GE7 Geometry Engine resides in location U43. The other three GE7 sockets are jumpered with an interconnect.
3. The VM2 memory module resides in location P14.

Graphics—XS24

The 24-bit XS24 graphics subsystem consists of the following:

- GR2 graphics motherboard
  - Configured with one GE7 Geometry Engine
- Three VM2 8-bit video memory modules
- VB1.1 Video Buffer daughter card
- MG1 VME adapter

Note: The XS24 graphics subsystem is the same configuration as the XS with the addition of two VM2 memory modules.



Comments

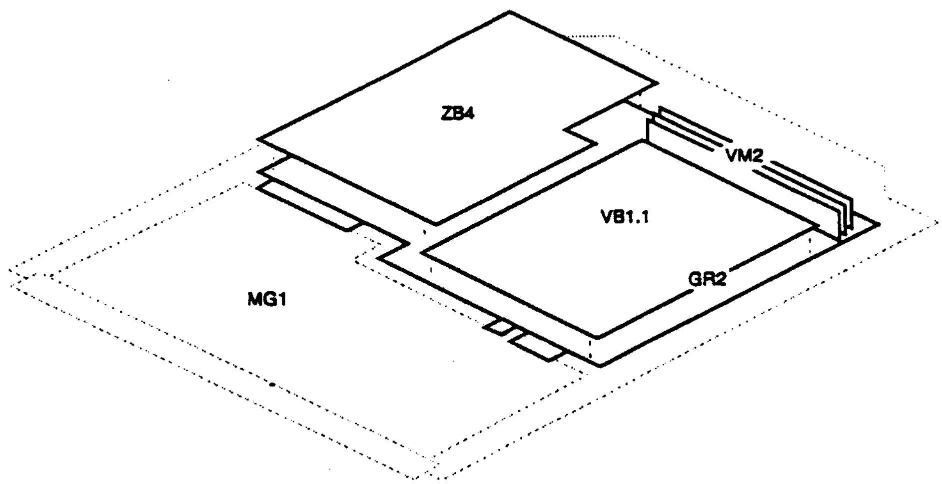
1. The XS24 graphics subsystem resides in slot 9.
2. The GE7 Geometry Engine resides in location U43. The other three GE7 sockets are jumpered with an interconnect.
3. The system will operate with one VM2 memory module (with downgraded performance); single VM2 must reside in location P14.

Graphics—Elan

The 24-bit Elan graphics subsystem consists of the following:

- GR2 graphics motherboard
  - Configured with four GE7 Geometry Engines
- Three VM2 8-bit video memory modules
- VB1.1 Video buffer daughter card
- ZB4 Z buffer daughter card.
- MG1 VME adapter

Note: The Elan graphics subsystem is the same configuration as the XZ24 with the addition of three GE7 Geometry Engines on the GR2 graphics motherboard and the ZB4 Z buffer daughter card.



Comments

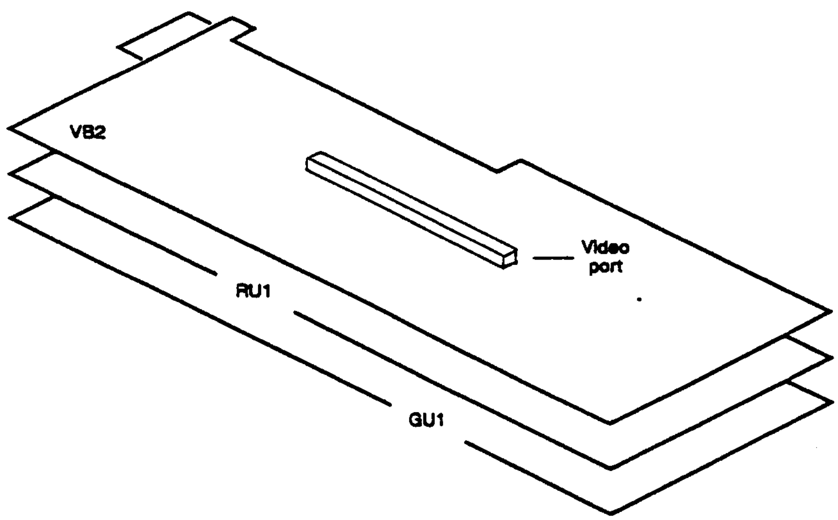
1. The Elan graphics subsystem resides in slot 9.
2. All four GE7 sockets are populated.
3. System will operate without ZB4 daughter card (with downgraded performance).
4. System will operate with one VM2 memory module (with downgraded performance); single VM2 must reside in location P14.

Graphics—Extreme

The Extreme (EX) graphics subsystem is a three-board graphics subsystem, which requires two adapters that enable it to be configured in a Crimson chassis.

- GU1 graphics unit—Contains eight GE7 Geometry Engine ASICs.
- RU1 raster unit—Contains two RE3 raster engine ASICs.
- VB2 video board—Contains the 13W3 video connector, GENLOCK connector, and a connector for graphics options such as stereo glasses. The VB2 also has a video expansion port.
- AB1 GIO adapter—Adapts EX graphics subsystem (physically and logically) to MG1 adapter. EX boards connect to AB1, which is connected to the MG1.
- MG1 VME adapter—Adapts EX subsystem and AB1 adapter to Crimson's 9U VME format.

Note: The EX graphics subsystem (GU1, RU1, and VB2) is also supported by Indigo^2 systems.



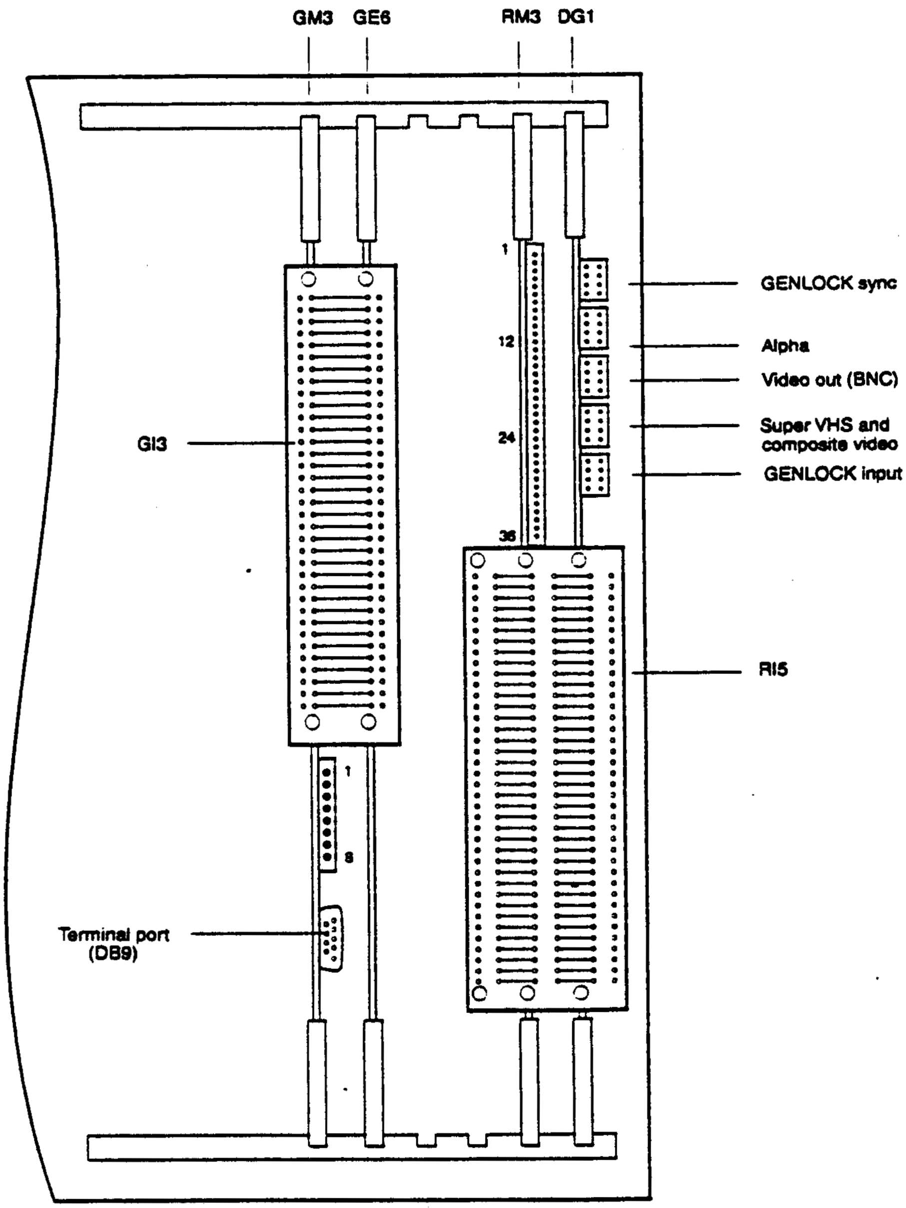
Comments

1. The EX graphics subsystem resides in slot 9.
2. RU1 and VB2 boards do not have connectors
   - RU1 board connects to GU1 board (two connectors)
   - VB2 board connects to RU1 board (two connectors)
3. All three graphics boards must be installed for system to operate.

Graphics—VGXT

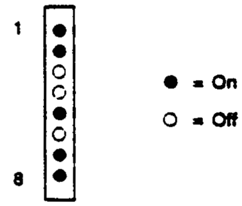
The VGXT graphics subsystem is a four-board subsystem configured with the following boards:

- GM3 Graphics manager
- GE6 Geometry Engine subsystem
- RM3 Raster manager
- DG1 Display generator

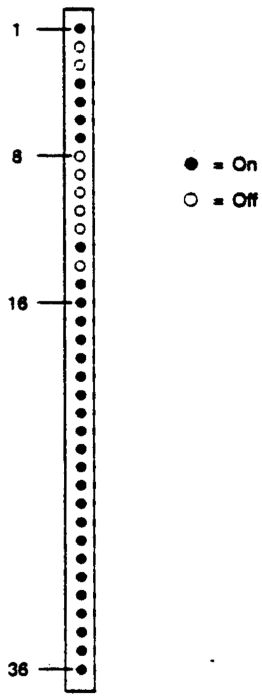


VGXT—Comments

1. To view the power-on diagnostics for the graphics subsystem, connect an ASCII terminal to the DB9 connector on the GM3 board. To enter the PROM Monitor, enter the terminal's "Break" key sequence.
2. While in the PROM Monitor (after system successfully passes its POSTs), the eight LEDs on the GM3 board will display the following pattern:



3. The GI3 edge connector connects the GM3 to the GE6 board.
4. The RI5 edge connector connects one or two RM3 boards to the DG1 board.
5. VGXT graphics require one RM3 board; systems can be configured with a second RM3 board.
6. The RM3 has a 36-LED status display. After the system successfully completes its POSTs, these LEDs display the following pattern:



7. The DG1 board has five video I/O connectors (from top to bottom):
   - GENLOCK sync output
   - Alpha output Video
   - RGB Video output and sync to monitor (use internal RGB ribbon cable, FRU# 018-0183-001)
   - Super VHS and composite video (use on systems with EV1 video option)
   - GENLOCK RGB input

VGXT Graphics—Slot Assignments

The following table contains slot assignments for the VGXT graphics subsystem for Crimson systems:

Slot	Graphics board
9	GM3
10	GE6
11	Optional video
12	Second RM3
13	First RM3
14	DG1

Graphics—Reality Engine

The Reality Engine (RE) graphics subsystem is a three-board subsystem configured with the following boards:

- GE8 Geometry Engine
- RM4 Raster manager
- DG2 Display generator

Comments

1. Reality Engine subsystems can be configured with one, two, or four RM4 raster manager boards.
2. The last RM4 raster manager in the graphics subsystem must be a terminated RM4 board, called an RM4T (FRU# 030-2360-001).
3. A DI1 edge connector connects the DG2 to RM4 board(s).

Reality Engine Graphics—Slot Assignments

The following table contains slot assignments for the Reality Engine graphics subsystem for Crimson systems:

Slot	Graphics board
9	GE8
10	DG2
11	Fourth RM4 (use RM4T)
12	Third RM4
13	Second RM4
14	First RM4

Monitors

See the following table for compatibility information for monitors supported by Crimson systems:

Size	Manufacturer	Manufacturer Model #	SGI FRU #	Input Connector
16"	Sony	GDM-1630SG	9330040	BNC
19"	Hitachi	CM2086A3SG	9330042	BNC
19"	Hitachi	CM2086A3CD	9330043	BNC
19"	Mitsubishi	HL7965KW-SG	9330812	BNC
19"	Sony	GDM-20D11	9330818	13W3
19"	Sony	GDM-1930SG	9330041	13W3

Note: Monitors with the manufacturer model number ending with "SG" have an SGI logo on the front bezel. Monitors with "CD" in the model number do not have an SGI logo.

Monitor Termination Switches

Most SGI monitors with BNC input connectors have impedance switches used to terminate the video signals. These termination switches are a push-button, toggle type usually located under each BNC connector. Switches can be set in the following two positions:

- When the switch is in the "in" position (75 ohm), the signal is terminated.
- When the switch is in the "out" position (High), the signal is not terminated.

For single-monitor systems, all switches should be set in the "in" position so that video signals are terminated. With daisy-chained monitors, only the last monitor should be terminated.

If a monitor is incorrectly terminated, the color may be incorrect or the video display may be distorted. When troubleshooting a monitor problem, make sure the termination switches are set correctly, depending on the specific configuration.

Peripheral Devices

This section includes drive ID and jumpering information for the SCSI peripheral devices supported by Crimson systems.

Disk Drives

Capacity	Manufacturer/Model #	SGI FRU Number
1.2GB	Seagate ST11200N	013-0570-001
1.2GB	IBM 0663E15	041-0062-001 (9410824)
2.4GB	IBM 0663 2.4GB	013-0571-001

Tape Drives

Capacity/Format	Manufacturer/Model #	SGI FRU Number
1.3GB DAT	Archive E4320NT	013-8451-001
5.0GB 8mm	Exabyte EXB-8500	041-0011-001

Media Devices

Device	Manufacturer/Model #	SGI FRU Number
644MB CD-ROM	Toshiba XM-3301B	050-8055-001 (9410040)

SCSI Addressing

The following table shows the typical drive IDs used for addressing SCSI devices on SGI systems. Use as a guide when addressing SCSI devices or determining drive ID for installed devices.

Drive ID	Device	Comments
1	Disk	The system disk drive (root drive) is always drive ID 1
2	Disk or tape	Alternative drive ID for tape drives which typically use drive ID 7
3	Disk	Optional disk drive
4	Disk	Optional disk drive
5	Disk	Optional disk drive
6	CD-ROM	CD-ROM typically uses drive ID 6; other drive IDs can be used
7	Tape	Tape drives typically use drive ID 7; drive ID 2 is alternative address

Note: Drive ID 0 is reserved for the SCSI controller.

Jumper Settings for Disk Drives

For Crimson systems, set jumpers so that

- Parity is enabled.
- Spindle motor starts on command.
- SCSI bus is terminated on last drive.

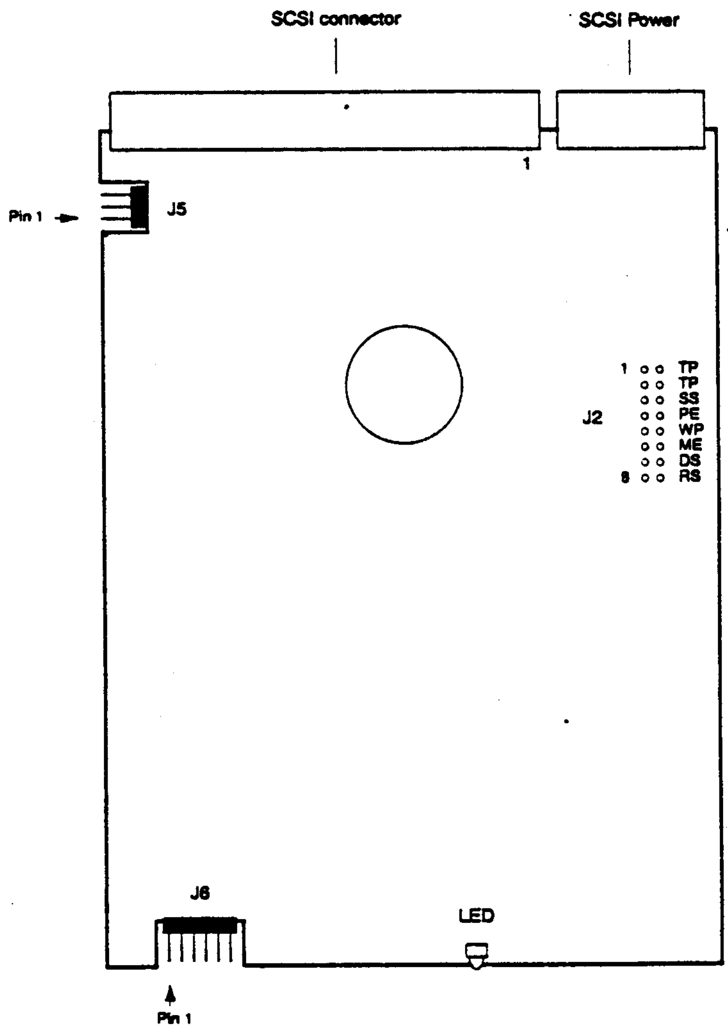
See information on individual drive for locations of appropriate jumpers.

Identifying Disk Drives

Use the fx utility to identify the manufacturer and manufacturer's model of disk drives installed in the system. For information about using fx to identify disk drives, see Section 3, page 3-23.

Disk Drives—1GB 3.5" SCSI-2

Seagate ST11200N



J2 Jumper Settings

		Setting	
Jumper	Description	In	Out
TP (1)	Termination power	Term. power to SCSI bus	Not term.
TP (2)	Termination power	Term. power to drive	Not term.
SS (3)	Reserved	–	Yes
PE (4)	Parity	Enabled	Disabled
WP (5)	Write protect	Enabled	Disabled
ME (6)	Motor start	Wait for start command	No delay
DS (7)	Motor start delay	Delay (16 sec. x drive ID)	No delay
RS (8)	Reserved	–	–

SCSI Drive ID (JB5 jumpers)

Drive ID	Jumper 1	Jumper 2	Jumper 3
1	In	Out	Out
2	Out	In	Out
3	In	In	Out
4	Out	Out	In
5	In	Out	In
6	Out	In	In
7	In	In	In

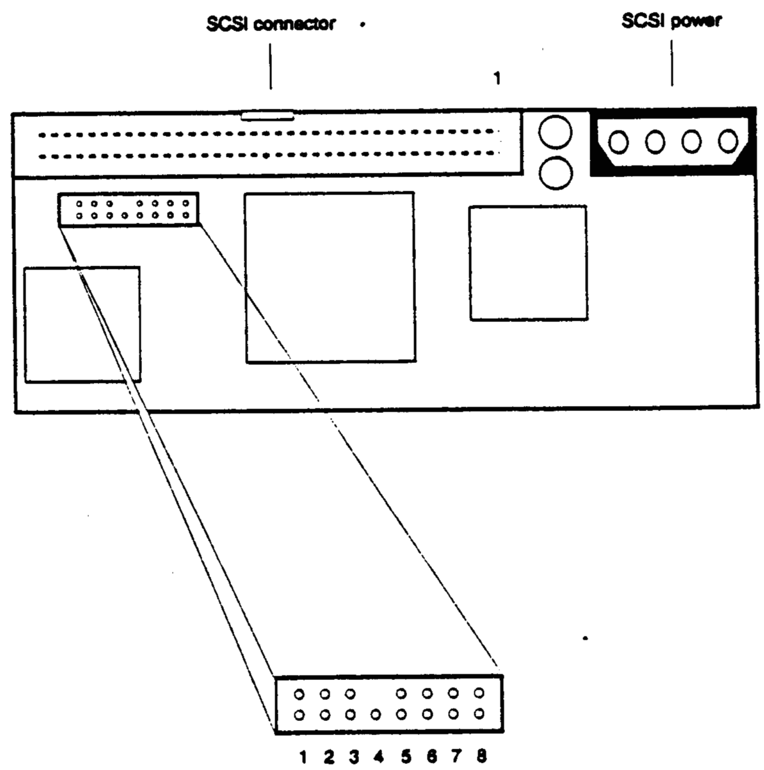
J6 Jumper Settings

Leave all pins on the J6 jumper block unjumpered.

Disk Drives—1GB 3.5" SCSI-2

IBM 0663E15

Rear view



Jumper Settings

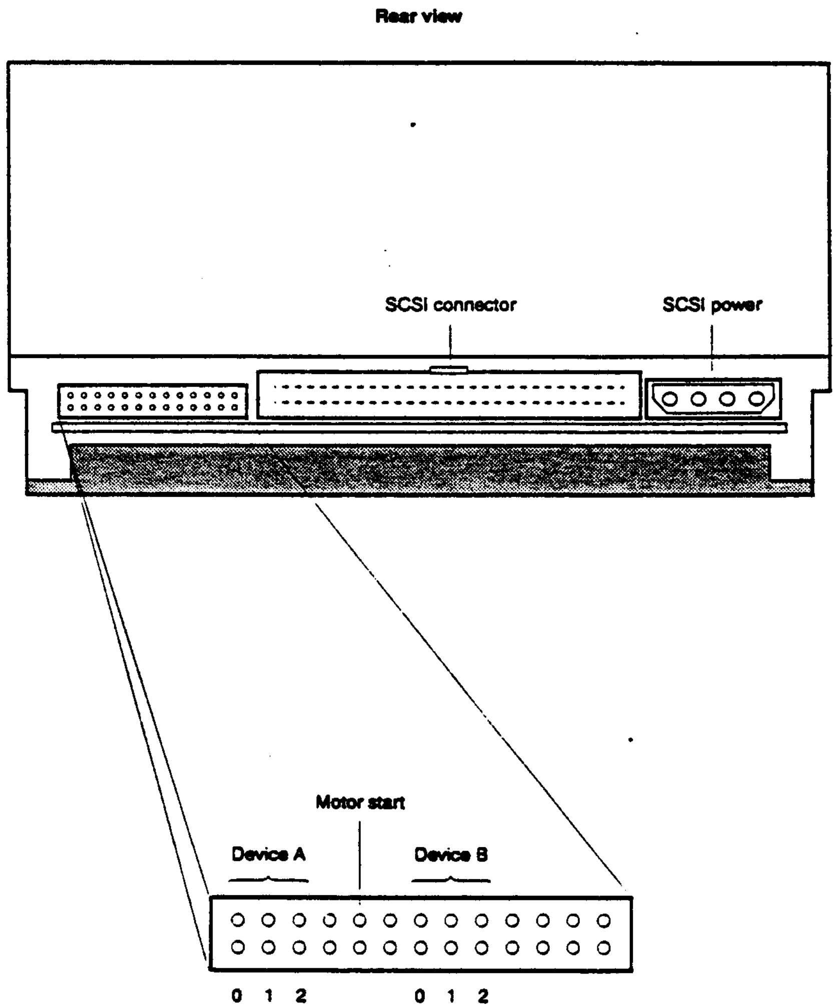
		Setting	
Jumper	Description	In	Out
1	SCSI ID	(see below)	
2	SCSI ID	(see below)	
3	SCSI ID	(see below)	
4	N/A	–	–
5	Motor start delay	Delay (10 sec. x drive ID#)	Wait to start
6	N/A	–	–
7	N/A	–	–
8	LED Power	Enabled	Disabled

SCSI Drive ID

Drive ID	Jumper 1	Jumper 2	Jumper 3
1	Out	Out	Out
2	In	Out	Out
3	Out	In	Out
4	In	In	Out
5	Out	Out	In
6	In	Out	In
7	Out	In	In

Disk Drives—2.4GB 5.25" SCSI-2

IBM 0663



Note: This disk drive consists of two 3.5" hard disk assemblies (HDAs) and a PCA controller, which are configured in a 5.25" enclosure. Each HDA (device A and device B) must be assigned a unique SCSI address (drive ID).

SCSI Drive ID

Use the table below and the illustration on the previous page to set SCSI drive ID for both devices. Each device must have its own SCSI address.

Drive ID	Jumper 0	Jumper 1	Jumper 2
1	Out	Out	Out
2	In	Out	Out
3	Out	In	Out
4	In	In	Out
5	Out	Out	In
6	In	Out	In
7	Out	In	In

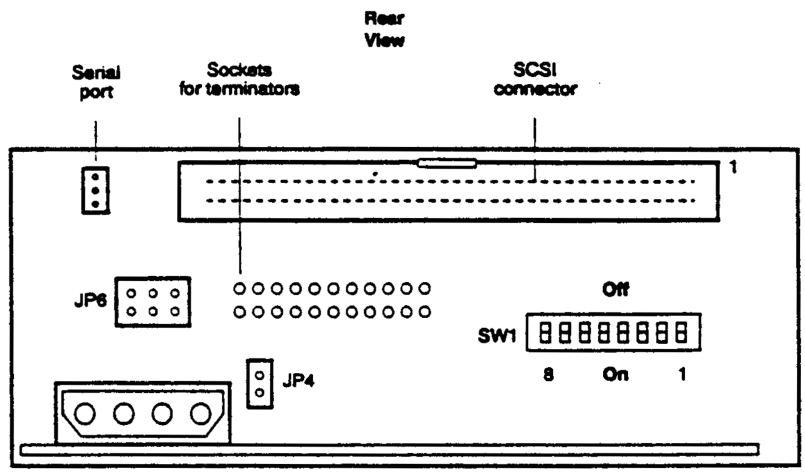
Motor Start

The motor start jumper controls when the drives' spindle motors spin-up.

- Jumper In—Delays spin-up 10 seconds times the drive's SCSI drive ID (for example, spin-up for drive with a SCSI ID set to 3 will be delayed 30 seconds).
- Jumper Out—Waits for start unit command

Tape Drives—1.3GB 4mm DAT SCSI

Archive E4320NT



SW1 DIP Switches

Set the DIP switches for the following:

- SCSI addressing
- Appropriate SCSI mode (SCSI or SCSI-2)
- Parity enabled
- Self test disabled

Switch	Description	Setting Off	On
1	SCSI addressing	(see below)	
2	SCSI addressing	(see below)	
3	SCSI addressing	(see below)	
4	SCSI mode	SCSI	SCSI-2
5	Parity	Disable	Enable
6	N/A	set to Off	
7	N/A	set to Off	
8	Self testing	Disable	Enable

SCSI Drive ID (SW1 DIP switches)

To use external SCSI addressing, set switches to drive ID 0.

Drive ID	Switch 3	Switch 2	Switch 1
0	Off	Off	Off
1	On	Off	Off
2	Off	On	Off
3	On	On	Off
4	Off	Off	On
5	On	Off	On
6	Off	On	On
7	On	On	On

Note: On SGI systems, tape drives are typically set to drive ID 2 or 7.

JP6 Jumpers

The JP6 jumper block also specifies SCSI addressing. Leave these jumpers out and use SW1 DIP switches to set the drive ID.

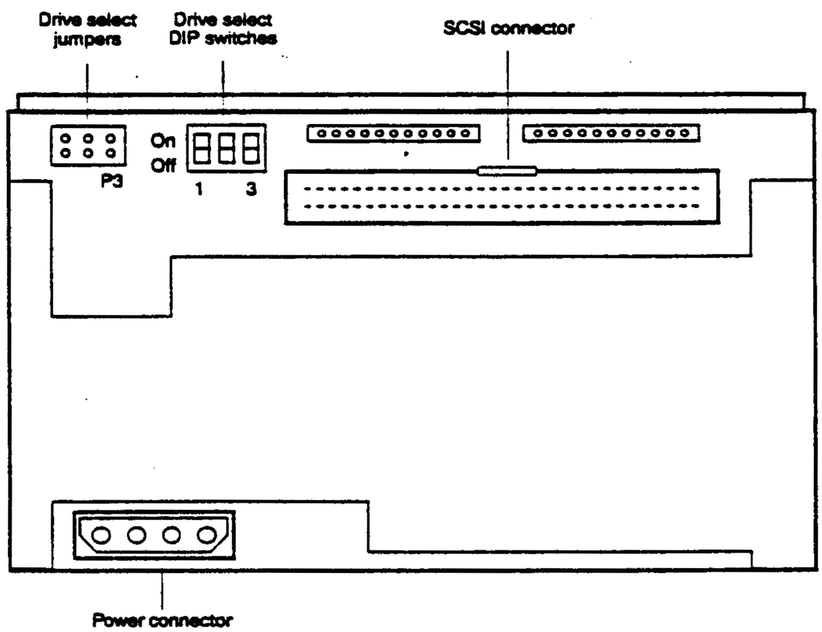
For external SCSI addressing, attach the SCSI addressing cable on the drive sled to JP6 jumper bank. The drive ID will be determined the drive bay in which the drive is installed.

JP4 Termination Jumper

		Setting	
Jumper	Description	In	Out
JP4	Terminator Power	Terminated	Unterminated

Tape Drives—5GB 8mm SCSI

Exabyte EXB-8500 (Full Height)



P3 Jumpers

The P3 jumper block also specifies SCSI addressing. Leave these jumpers open and use DIP switches to set the drive ID.

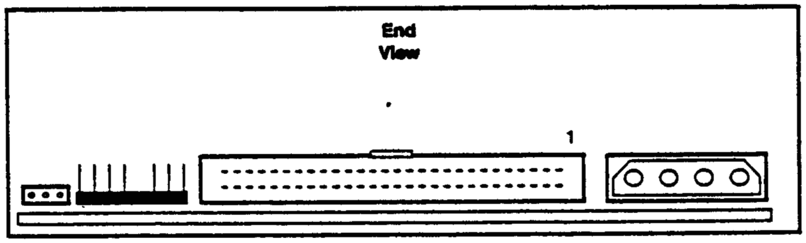
SCSI Drive ID (DIP switches)

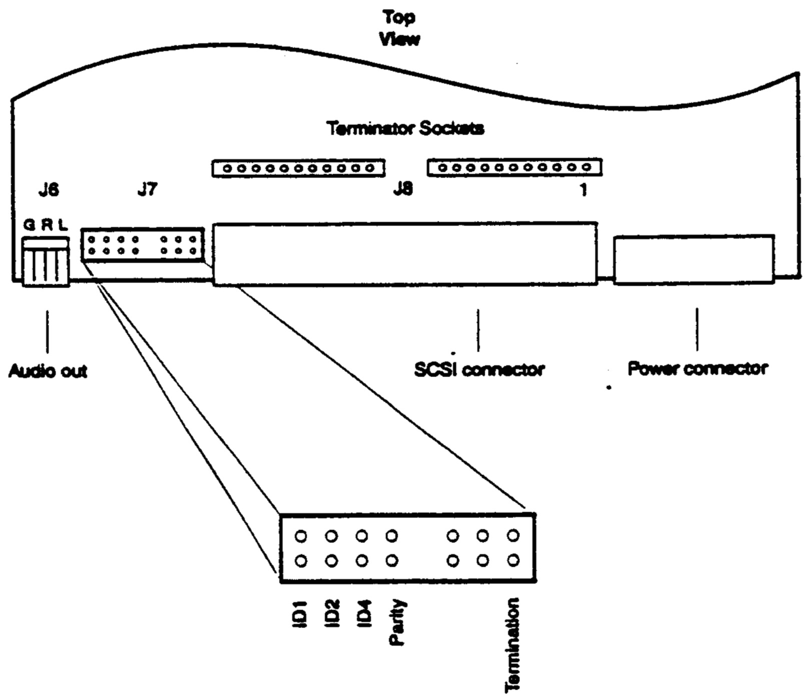
Drive ID	Switch 1	Switch 2	Switch 3
1	On	Off	Off
2	Off	On	Off
3	On	On	Off
4	Off	Off	On
5	On	Off	On
6	Off	On	On
7	On	On	On

Note: On SGI systems, tape drives are typically set to drive ID 2 or 7.

CD-ROM Drive—644MB

Toshiba XM-3301B





J7 Jumper Settings)

Jumper	Description	Setting In	Setting Out
ID1	SCSI addressing	(see below)	
ID2	SCSI addressing	(see below)	
ID4	SCSI addressing	(see below)	
Parity	Parity Checking	Enabled	Disabled
Termination	Terminator Power	Terminated	Unterminated

SCSI Drive ID

Drive ID	Jumper ID1	Jumper ID2	Jumper ID4
1	In	Out	Out
2	Out	In	Out
3	In	In	Out
4	Out	Out	In
5	In	Out	In
6	Out	In	In
7	In	In	In

Note: On SGI systems, the CD-ROM drive is typically set to drive ID 6.

Section 3—Operation

This section is a quick reference to system level software used in maintaining and troubleshooting Crimson systems. This section also includes a procedure for testing power supply voltages.

- PROM Monitor
  - Command Monitor commands
  - PROM Monitor Environmentals
- Forcing console output to the Diagnostic Port
- Booting the system
- Standalone shell (sash)
  - Booting sash
  - sash Commands
- fx (disk drive format and exercise utility)
  - Booting fx
  - fx commands
  - Running fx
  - Formatting and labeling the disk drive
  - Adding bad blocks to the bad block list
  - Identifying disk drives
- Using Integrated Diagnostics Environment (IDE)
- Rebuilding the kernel
- Testing power supply voltages

PROM Monitor

The PROM Monitor is firmware that resides in PROMs located on the CPU board. Use the PROM Monitor to:

- Access diagnostic console on an ASCII terminal (connected to serial port 1)
- Access and change the PROM Monitor environmentals
- Load the standalone shell (sash)
- Run basic system diagnostics
- Install the operating system

The PROM Monitor also performs basic power-on self tests (POSTs). After the system passes its POSTs, it displays the System Maintenance Menu:

```
System Maintenance Menu
1) Start System
2) Install System Software
3) Run Diagnostics
4) Recover System
5) Enter Command Monitor
Option?
```

From this menu, you can enter the Command Monitor, which enables you to do variety of maintenance tasks.

Command Monitor

To enter the Command Monitor, from the System Maintenance Menu, enter *5*. The system displays the >> prompt.

To display the Command Monitor commands:

- At the >> prompt, type **help** and press **<Return>**.

  The system displays the following commands:

auto	Performs an automatic boot.
boot	Boot a specified boot device and file (see page 3-7 for boot command syntax).
exit	Exits Command Monitor; returns system to PROM Monitor.
help	Displays Command Monitor menu; also displays information on specific command (**help** *command*).
init	Writes current environmentals to non-volatile memory (NVRAM). Use **init** after changing an environmental. Note: After using **init**, the **resetenv** command will not reset environmentals to previous values.
hinv	Displays list of installed hardware; does not list non-SCSI devices.
passwd	Use to password protect the PROM Monitor.
printenv	Displays current settings for PROM Monitor environmentals. (See the next page for descriptions.)
resetpw	Resets the password for entry into the PROM Monitor.
setenv	Used to change PROM Monitor environmental (**setenv** *environmental value*).
unsetenv	Reverts PROM Monitor environmental to previous value (**unsetenv** *environmental*); does not work if you used **init** command after changing environmental.
cp	The copy command can be used to copy devices
version	Displays the PROM Monitor revision and the system's CPU type.
ecc	Displays the error correction checking (ECC) memory log. Use the following syntax:

ecc 1	Displays ECC log
ecc 0	Clears ECC log

PROM Monitor Environmentals

Use the **printenv** command to display the following PROM Monitor environmentals and their current values. To change the value of an environmental, use the setenv command and the following syntax:

setenv *environmental value*

Environmentals

netaddr Displays the system's Internet (IP) address.

dbaud Displays the baud rate for the diagnostics terminal, which you attach to serial port 1.

rbaud Displays the baud rate for serial port 2, which connects to a dbx terminal used for finding bugs in the operating system.

bootfile Displays pathname of file used to boot the system; default file is the standalone shell (sash).

bootmode Specifies type of boot performed by the PROM Monitor after the system completes its POSTs. The **bootmode** environmental has two possible values:

- **c** Cold boot; system boots IRIX when powered-on or reset.
- **m** PROM Monitor; system enters PROM Monitor when powered-on or reset.

The bootmode environmental also indicates when an error occurs during power-on diagnostics. When an error occurs, an **e** replaces the **bootmode** value and remains the current value until changed back to **c** or **m**.

console Displays device configured as system console. Use one of the following settings:

- **d** Selects serial port1 as console; used for displaying diagnostics on ASCII terminal connected to serial port1
- **g** Selects graphics monitor and keyboard as system console
- **G** Same as g, but enables system to display SGI logo
- **b** Selects both graphics monitor and serial port 1 (diagnostics) as system console

root Points to location of root partition on system disk drive; use the following path for SCSI disk drives:

dks0d1s0

monitor Specifies scan rate of graphics monitor; available settings include:

60 (60 MHz is default)

30

ntsc

pal

343

sync_on_green Specifies the sync signal for the monitor.

diskless Indicates whether or not system has a disk drive:

1 = no disk drive

0 = installed disk

path Points to location of the volume header on system disk drive; use the following path for SCSI disk drive:

dksc(0,1,8)

dbootfile Points to location of standalone diagnostics program; default is IDE.

gfx Indicates whether or not PROM Monitor sees graphics subsystem and keyboard. If system does not see graphics or keyboard, the gfx environmental displays a **dead** or **no keyboard** value.

Forcing the Console to the Diagnostic Port

If you do not have control of the graphics console (monitor may be unreadable or blank and system will not accept commands from keyboard), it may be necessary to force the console to the diagnostic port.

To force console output to the diagnostics port:

1. Install an ASCII terminal to serial port1 of the system.
2. Configure the terminal for 9600 baud, 8 bit, 1 stop bit, no parity.
3. Power off system and disconnect the keyboard.
4. Power on system.
5. To enter the Command Monitor, from the System Maintenance Menu, enter **5**. The system displays the >> prompt.
6. To set console environmental to diagnostics, at the Command Monitor prompt, enter **setenv console d**.
7. At the Command Monitor prompt, enter **init**.
8. Power off the system and reconnect the keyboard.
9. Power on system.

   The ACSII terminal connected to serial port 1 is now the system console.

Booting the System

Manual booting from the PROM Monitor allows you to select the boot device and the boot program. This enables you to boot the system using devices and programs different from the system disk drive and standard boot program.

To boot the system manually, use the **boot** command in the Command Monitor and the following syntax:

boot [**-fn**] *device*(x,y,z)*filename* [*argument*]

-f	Prevents PROM Monitor from using boot program specified in **bootfile** environmental (since default setting for **bootfile** points to sash, **-f** option prevents system from loading sash)
-n	Allows system to access disk drive, locate boot program and loads it into system memory, but does not execute boot program.
device	Indicates the type of boot device. Possible boot devices include:

dksc	SCSI disk drive (includes CD-ROM)
tpsc	SCSI tape drive (QIC)
bootp	Network
tpqic	VME tape drive (QIC)

(x,y,z) Specifies controller, device address, and partition

x	Selects the controller
y	Selects the device address (SCSI disks start at drive ID 1)
z	Selects partition where boot program is located

filename Name of boot file being loaded by the PROM Monitor. Files include:

sash	Standalone shell
fx	Disk drive format and exercise utility
ide	Integrated Diagnostics Environment

See table on next page for a list of bootable files and bootable devices.

argument Supplies additional instructions concerning the boot process. Two useful arguments include:

initstate Specifies the system init state (also called run level). Use format **intitstate=x**, where *x* is the specified run level. See table on page 3-11 for descriptions of run levels).

showconfig Displays the system configuration while system is booting up. Use the format **showconfig=istrue.**

Bootable Files—System Disk Drive

Filename	Boot device/File location	Boot command
sash	SCSI System disk: **dksc(0,1,8)**	**boot -f dksc(0,1,8)sash**
ide*	SCSI System disk: **dksc(0,1,0)**	sash: **dksc(0,1,0)/stand/ide**
fx	SCSI System disk: **dksc(0,1,0)**	sash: **dksc(0,1,0)/stand/fx**

***Note:** This file will only be on the system disk drive if it was loaded from Installation tool.

Bootable Files—Media Devices

Filename	Boot device/File location	Boot command
sashIP17	SCSI Tape (drive ID 2): **tpsc(0,2,0)**	**boot -f tpsc(0,2,0)sash.IP17**
	SCSI Tape (drive ID 7): **tpsc(0,7,0)**	**boot -f tpsc(0,7,0)sash.IP17**
	CD-ROM: **dksc(0,6,8)**	**boot -f dksc(0,6,8)sashIP17**
Ide.IP17	Tape (drive ID 2): **tpsc(0,2,0)**	**boot -f tpsc(0,2,0)Ide.IP17**
	Tape (drive ID 7): **tpsc(0,7,0)**	**boot -f tpsc(0,7,0)Ide.IP17**
	CD-ROM: **dksc(0,6,7)/stand**	sash: **dksc(0,6,7)/stand/Ide.IP17**
fx.IP17	Tape (drive ID 2): **tpsc(0,2,0)**	**boot -f tpsc(0,2,0)fx.IP15**
	Tape (drive ID 7): **tpsc(0,7,0)**	**boot -f tpsc(0,7,0)fx.IP17**
	CD-ROM: **dksc(0,6,7)/stand**	sash: **dksc(0,6,7)/stand/fx.IP17**

Run Levels

Run Level	Description
s	Single user mode
0	System is shut down or in PROM Monitor mode
1	Single-user mode
2	This is the normal run level for multi user mode
3	Multi-user mode (with network disabled)
4	Alternate run level for multi-user
5	Special run level for system admin uses
6	System reboot

Standalone Shell (sash)

The standalone shell (sash) contains commands used to perform system maintenance.

To boot sash:

- At the >> prompt, use the following format:

  `boot -f device(x,y,z)filename`

  Use the bootable file tables on page 3-9 and page 3-10 for the applicable device, file location, and filename.

- If the **bootfile** environmental points to sash—typically located at dksc(0,1,8) on SCSI drives—at the >> prompt, enter **boot**.

After you boot sash, the system displays the sash: prompt.

sash Commands

Use the **help** command to display the following sash commands:

boot	Boots specified program on specified device; similar to the boot command in the Command Monitor.
	Example: `boot -f dksc(0,1,8)fx`
cat	Reads a file and displays it on standard output device.
	Example: `cat dksc(0,1,6)/adm/SYSLOG`
copy	Use to copy files or file systems; copies block by block.
	Example: `cp dksc(0,1,1) dksc(0,2,1)`
go	Executes the listed booted program into memory.
help	Displays the sash commands and their syntax.
install	Loads the installation tools.
ls	List files and directories in the UNIX file system.
	Example: **ls dksc(0,1,0)/**
printenv	Displays the PROM Monitor environmental variables and their current values.
setenv	Use to set an environmental variable.
unsetenv	Use to revert a PROM Monitor environmental variable to its previous value.
version	Displays PROM Monitor version and the system's CPU type.

fx

fx is a formatting and exercise utility used for basic maintenance on disk drives.

Booting fx

A variety of ways exist to boot fx.

To boot fx from the system disk:

- From the Command Monitor prompt (>>), enter the following command for a SCSI system disk drive

  boot -f dksc(0,1,8)fx

- For any type of disk drive, from the sash: prompt, enter **fx**

To boot fx from the tape drive:

- If the tape drive is a SCSI device with drive ID 2, at the >> prompt, enter

  `boot -f tpsc(0,2,0)fx.IP17`

- If the tape drive is a VME QIC device, at the >> prompt, enter

  `boot -f tpqic(0,0.0)fx.IP17`

To boot fx from CD-ROM:

1. To boot sash, from the >> prompt, enter

   `boot -f dksc(0,6,8)sashIP17`

2. To boot fx, at the sash: prompt, enter

   `dksc(0,6,7)/stand/fx.IP17`

To boot fx from the network:

- Configure a boot server (with attached CD-ROM or tape drive) to provide bootable files to a client system on the network; configure the client so that it can boot fx over the network.

  Note: Before configuring the boot server, make sure there is enough disk space in the */usr* file system for the */dist/sa* file.

  - In IRIX 4.0.5, */dist/sa* is 21 MB.
  - In IRIX 5.2, */dist/sa* is 28 MB.

On the boot server

1. Edit the */usr/etc/initd.conf* file. At the IRIX system prompt, enter

   `vi /usr/etc/inetd.conf`

2. Locate the following line:

   `tftp dgram udp wait guest /usr/etc/tftpd tftpd -s` *bootpath*

3. Edit the above line to so that *bootpath* is */usr/local/boot*:

   `tftp dgram udp wait guest /usr/etc/tftpd tftpd -s /usr/local/boot`

4. Save and quit the */usr/etc/initd.conf* file.

5. Create a directory called */usr/local*. At the system prompt, enter

   `mkdir /usr/local`

6. In the */usr/local* directory, create a subdirectory called *boot* (by default, network bootable files must reside in */usr/local/boot* on the boot server). At the prompt, enter

   `mkdir /usr/local/boot`

7. Make a directory called */usr/local/boot/dist*. At the system prompt, enter

   `mkdir /usr/local/boot/dist`

8. From a IRIX distribution CD-ROM or tape, copy the */dist/sa* file (which contains all bootable files) into the */usr/local/boot/dist* directory. Depending on the media, do one of the following:

   CD-ROM

   a. Mount the boot server's CD-ROM on */CDROM*.

   b. Copy the bootable files to */usr/local/boot/dist*. At the system prompt, enter

      `cp -r /CDROM/dist/sa /usr/local/boot/dist`

   Tape

   - Copy the bootable files to */usr/local/boot/dist*. At the system prompt, enter

     `distcp -vwr /dev/nrtape /usr/local/boot/dist "sa"`

   The boot server is now configured so that client systems can boot fx over the network. In addition to fx, clients can also boot the stand-alone shell (sash) and the Integrated Diagnostics Environment (IDE).

On the client system

1. To set the **netaddr** environmental (in the PROM Monitor) using the client's Internet address, at the >> prompt, enter

   `setenv netaddr` *`ipaddress`*

2. To set system to ignore installed media device (even if the client has no media device), at the >> prompt, enter

   `setenv tapeless 1`

3. To create a variable that points to the bootable files in the */usr/local/boot/dist* directory on the boot server, at the >> prompt, enter

   `setenv tapedevice bootp()`*`serverhostname`***`:/usr/local/boot/dist/sa`**

4. To boot fx over the network, at the >> prompt, enter

   `boot -f $tapedevice(fx.IP17)`

Note: See the table on page 3-10 for names of other bootable files.

Running fx

After using one of the above methods to boot fx, the system displays the following message:

```
Currently in safe read-only mode
Do you require extended mode with all options available with
all options available? (no)
```

1. Enter y
2. At the `fx: "device-name" = (dksc)` prompt, enter the device name for the disk drive or press <Return> to use the device in parenthesis.
3. At the `fx: ctlr# = (0)` prompt, enter the number of the device's controller or press <Return> to use the controller number in parenthesis.
4. At the `fx: drive-type = (type)`, enter the type of the disk drive or press <Return> to use the type in parenthesis.
5. At the `fx: drive# = (1)`, enter the drive ID number of the disk drive or press <Return> to use the number in parenthesis.

   The system displays the fx menu and `fx>` prompt:

```
----- please choose one (? for help, .. to quit this menu)-----
[exi]t            [d]ebug/          [l]abel/          [a]uto
[b]adblock/       [exe]rcise/       [r]epartition/    [f]ormat
fx>
```

Running fx in IRIX

fx is also available when the IRIX operating system is running. Use the following command to start fx in a read-only mode.

Note: To use fx in IRIX, you must be logged in as root.

To start fx in IRIX:

1. At the IRIX system prompt, enter **/usr/bin/fx**.

   The system prompts you to select the device name, the controller number, and the drive ID number.

2. Select the device name, the controller number, and the drive ID number for the drive that you want to identify.

   After displaying a warning message and the manufacturer's model number for the selected drive, the system displays the fx> prompt.

fx Commands

fx offers the following commands:

exit Exits fx. During an fx session, a copy of all disk label information is maintained in memory. If you have made changes to the buffer, you have the option to write this information to disk when you exit. fx will ask if you want to re-create the drive label.

debug Provides capability to read, write, and dump blocks of data. Debug is used primarily for engineering and manufacturing (not needed for field service).

label Enables you to do various tasks to a disk drive label. You can use **label** to read the disk's existing label or create a new label using default values.

Note: Labeling the drive destroys existing data and files in the volume directory.

The **label** command contains four sub-commands:

- **show** Shows existing contents of disk label. The **show** command contains a number of sub-commands.
- **sync** Writes label in memory buffer to disk.
- **set** Contains sub-commands that allow you to change drive information such as boot information, drive parameters, and partition.
- **create** Contains sub-commands that allow you to create a default SGI label, which includes parameters for boot information, drive parameters, and default partitions.

auto Creates the SGI disk label and formats the disk. Auto is a good choice for formatting a virgin disk drive.

badblock Allows you to access or manipulate the bad block list contained in the disk label on ESDI disk drives. For SCSI drives, you can only display the bad block list.

For SCSI disk drives, only the following **badblock** commands are available:

- **adbb** Add new bad blocks to badblock list in buffer.
- **showbb** Display badblock list from buffer.

exercise Offers a variety of disk exercises. After formatting the disk, use the exercise function to find bad blocks. If a bad block is detected during an exercise, the head and cylinder location of the bad block is entered into the memory buffer. When you exit fx, you have the option to re-create the disk label, which will assign an alternative track to a bad block.

The **exercise** commands perform the following functions:

butterfly	Performs butterfly exercise
errlog	Print error log
random	Performs random seek exercise
sequential	Performs sequential test
stoponerror	Set to stop exercise when error occurs
settestpat	Sets test pattern for exercise
showtestpat	Prints data test pattern
complete	Performs complete read/write test

repartition Use to repartition a disk drive. The following sub-commands are available:

rootdrive	Use to repartition a drive that will be used as the root (system) drive.
optiondrive	Use to repartition a second disk drive (one that will not be used as the root drive).
resize	Use to repartition a partition on a disk drive. When you use **resize**, other disk partitions are adjusted to accommodate the changes.
expert	Use to manually set partition sizes and types.

Note: Repartitioning the drive can destroy data.

format Formats the disk drive. Use to format the entire drive or sections of the drive. Formatting the disk drive destroys any existing data that resides in the volume header of the disk label (such as sash, fx, and IDE).

Formatting and Labeling a System Disk Drive

To format the disk drive:

1. Boot fx (see page 3-13 for procedures for booting fx).
2. At the extended mode prompt, enter **y**.
3. At the device name, controller #, and drive # prompts, select the appropriate values.
4. To select the **format** command from the fx main menu, at the fx> prompt, enter **f**.

   The system will prompt you for which drive parameters to use.

Note: When formatting an unformatted drive, use the default drive parameters.

5. To select the current (default) parameters, press **<Return>**.

   The system displays the prompt, "about to destroy data...ok?"

6. To format the disk drive, at the "...ok" prompt, enter **yes**.

   The system formats the disk drive. When formatting is complete, system returns to fx main menu. After formatting, label the disk drive.

To label the disk drive:

1. From the fx main menu, at the fx> prompt, enter **l**.
2. To create a label, at the fx/label prompt, enter **c**.
3. To create a complete label, at the fx/label/create prompt, enter **a**.

   The system creates the new label.

4. To go back up to the label menu, at the fx/label/create prompt, type **..** and press **<Return>**.
5. To write (sync) the new label to the volume header of the disk drive, at the fx/label> prompt, enter **sy**.

   The system writes the label to the disk drive and displays the message, "writing label info to dksc(0,1,)"

6. To exit fx, at the fx/label> prompt, enter **../exit**.

   The system returns to the System Maintenance Menu.

Formatting, Labeling, and Repartitioning a Second Disk Drive

To format the disk drive:

1. Boot fx (see page 3-13 for procedures for booting fx).
2. At the extended mode prompt, enter y.
3. At each of the device name and controller # prompts, select the appropriate value.
4. At the drive# prompt, enter the appropriate drive ID. (Drive ID 1 is reserved for system disk drive).
5. To select the **format** command from the fx main menu, at the fx> prompt, enter f.

   The system will prompt you for which drive parameters to use.

Note: When formatting an unformatted drive, use the default drive parameters.

6. To select the current (default) parameters, press **<Return>**.

   The system displays the prompt, "about to destroy data...ok?"

7. To format the disk drive, at the "...ok" prompt, enter yes.

   The system formats the disk drive. When format is complete, system returns to fx main menu.

To label and repartition the disk drive:

1. From the fx main menu, at the fx> prompt, enter l.
2. To create a label, at the fx/label prompt, enter c.
3. To create a complete label, at the fx/label/create prompt, enter a.

   The system creates the new label.

4. To go back up to the main menu, at the fx/label/create prompt, type ../.. and press **<Return>**.
5. To repartition the drive, at the fx> prompt, enter r.

   The system displays the current partition table and the repartition menu.

6. To repartition the drive as an option drive (non-system drive), at the fx/repartition prompt, enter o.

   System displays message warning that existing data will be lost when drive is repartitioned.

7. To repartition the disk (and lose existing data), at the Continue? prompt, enter y.

   System repartitions disk label, writes the label to the volume header, and displays the new partition table.

8. To exit fx, at the fx/label> prompt, enter ../exit.

   The system returns to the System Maintenance Menu.

Exercising a Disk Drive

1. Boot **fx** (see page 3-13 for procedures for booting fx).
2. At the extended mode prompt, enter **y**.
3. At the device name, controller #, and drive #, select the appropriate value.
4. To select the **exercise** command, from the fx> prompt, enter **exe**.

   The system displays the exercise subcommands.

```
fx> exe
----- please choose one (? for help, .. to quit this menu)-----
 [b]utterfly     [r]andom        [st]op_on_error [sh]owtestpat
 [e]rrorlog      [seq]uential    [s]ettestpat    [c]omplete
fx/exercise>
```

5. To run a test, at the fx/exercise prompt, enter the command for the test you want to run (See page 3-18 for a description of the exercise tests).

   When the test is selected, the system will prompt you for a modifier (default modifier is read only). The available modifiers are

   - **[rd]**-only: Read only; a read-data command will check for read-complete.
   - **[ro]**-cmp: Read and compare; system compares two disk read commands.
   - **[s]**eek: Seek; performs a seek and read command to every disk block. (This test takes a long time to complete.)
   - **[wr-o]**nly: Write only; write command looks for a write complete.
   - **[wr-c]**mp: Write compare; write command followed by a read and compare.
6. To select a modifier, at the prompt, enter the command for the modifier.

   The system runs the test. Note that the system ignores the badblock list.
7. To display the error log after the test is complete, at the fx/exercise> prompt, enter **e**.
8. To exit fx, at the fx/exercise> prompt, enter **../exit**.

   The system returns to the System Maintenance Menu.

Adding to the Bad Block List

If fx discovers a bad block on a disk drive during an exercise, you can use fx to add the block to the disk's bad block list.

To add a bad block to the bad block list

1. Boot fx. See page 3-13 for the procedures for booting fx.
2. At the extended mode prompt, enter y.
3. At the device name, controller #, and drive #, select the appropriate values.
4. To select the **bad block** command, at the fx> prompt, enter **b**.
5. To select the **addbb** (add new badblock to badblock list) command, at the fx/badblock> prompt, enter a.

   The system prompts you for a bad block number:

   ```
   please enter a bn from 0 to xxxxx
   fx/badblock/addbb: add badblock:
   ```

6. At the add badblock: prompt, enter the bad block number.

   After you enter the bad block number, fx attempts to save the data. The system then redisplays the add badblock: prompt.

7. Repeat step 6 to add additional bad blocks.
8. When finished adding bad blocks, exit the **addbb** utility. At the add badblock: prompt, type .. and press **<Return>**.

   The system displays the fx/badblock prompt.

9. To exit fx, at the fx/badblock> prompt, enter ../exit.

   The system returns to the System Maintenance Menu.

Identifying Disk Drives

Use the fx utility (from the PROM Monitor or from IRIX) to identify the manufacturer and manufacturer's model number of the disk drive(s) installed in the system.

To identify a disk drive

1. Boot fx. See page 3-13 for the procedures for booting fx.

   Note: If you boot fx from the PROM Monitor, the system asks if you want to run fx in an extended mode (write mode).

2. If the system displays an extended mode prompt, enter **n**.
3. At the device name, controller #, and drive #, select the appropriate values.
4. At the fx> prompt, enter **label/show/all**.

   The system displays detailed information about the disk drive.

5. To exit fx, at the fx> prompt, enter **exit**.

Integrated Diagnostics Environment (IDE)

The Integrated Diagnostics Environment (IDE) for SGI systems is comprised of a set of manufacturing tests that field service personnel can use to troubleshoot hardware problems to the FRU level.

IDE can be run from either the graphics console or the diagnostic console.

Running IDE

The IDE tests can be run in two ways:

- **From the System Maintenance Menu**
  1. Select 3.

     The system prompts you for the location (media device) of IDE.
  2. Select the appropriate media device.

     The system displays the DIAGS: prompt.

- **From bootable media**
  - To boot IDE from the CD-ROM drive, from the sash: prompt, enter

    dksc(0,6,7)/stand/ide.IP17

    When IDE is booted, the system displays the DIAGS: prompt.

  - To boot IDE from a tape drive (drive ID 2), from the >> prompt, enter

    boot -f tpsc(0,2,0)ide.IP17

    Note: If the tape drive is configured as drive ID 7, use **tpsc(0,7,0)ide.IP17** to boot IDE.

    When IDE is booted, the system displays the DIAGS: prompt.

  - To boot IDE from the system disk (with IRIX and IDE installed), at the sash: prompt, enter

    /stand/ide

To interrupt these tests, type **<Ctrl-c>** and then **<Return>**. The system displays the DIAGS: prompt.

Note: IDE is not installed by default. It must be copied into the */stand* directory from the installation media.

When you run IDE, it automatically performs the processor and the graphic subsystem tests.

IDE Commands

To display a list of available IDE commands, at the DIAGS: prompt, enter **help**. The system displays the following commands:

help: ?	Displays the list of IDE tests and options
auto: a	Executes all the tests setup in the test table.
hardware: c	(The hardware configuration command is no longer supported.)
dump: d	Dumps the address mapping of the SCSI and VME buses.
flags: f	Use to configure a test. With these flags you can pick the processor to run diagnostics on, designate the amount of memory tested, change the reporting level, select the tests to be run, and select the I/O devices to be tested. See the next page for a description about using flags to configure IDE tests.
init: i	Sets the logfile to all zeros.
logfile: l	Prints the logfile to the display.
menu: m	Prints the available tests or subtests. When used without an argument, the **menu** command lists the available test groups. The command **m** *testgroup* displays a list of the subtests within *testgroup*. Each subtest is designed to test a specific area of logic on a board or device. Subtests can be run individually or as a group.

IDE Test groups:

cpu	CPU tests; includes data cache tests
bus	Backplane bus tests; called SYNC bus tests
memory	Memory tests; includes sockets, addressing, data
path	Test the ability to read/write to the cache using all paths
io	Tests the I/O board, SCSI buses, and VME bus
fpu	Floating point unit tests

quit: q	Quits IDE.
execute: x	Executes an IDE test; also use to loop a test multiple times.

System Configuration Flags

Use the system configuration flags to configure IDE to execute specific tasks, such as

- Selecting tests to be run
- Selecting amount of memory to be tested
- Selecting I/O devices to be tested
- Changing the reporting level

Each flag can be set to different states, which define parameters for IDE tests.

Displaying IDE Flags

To display a list of the available flags and their current states

- At the DIAGS: prompt, enter f.

  The system displays each flag and the current state to which flag is set:

```
m: memory testing area: from 0x400000 to 0x37ffffc
b: Block Mode is on
r: Remote log file is on
e: current error mode is 1 which is continue after error occurs
v: Verbose Mode
k: Disk Write Mode is off (no tests will write to disks)
w: Warning Message Mode is on
a: current auto execution table is LONG table
d: vme devices for io test are ipi(0,0,1)
t: scsi devices for io test are dksc(0,1,1)
i: vme devices for mp test are ipi(0,0,1) ipi(1,0,1)
c: scsi devices for mp test are dksc(0,1,1) dksc(1,1,1)
p: Parity and ECC exceptions enabled
```

To display possible states for a flag:

- At the DIAGS: prompt, enter

  f flagname ?

  System displays possible flag states and descriptions for specified flag.

To change a flag state:

- At the DIAGS: prompt, enter

  f flagname flagstate

IDE Flags

m Memory; use to setup the area of memory to be tested. Note that IDE resides in the first four MBs of memory. In older versions of IDE, the default setting tests 12 MB of memory.

Example: **f m 800000:8ffffc**

b Block mode; sets up the type of I/O transfer used during a test. Can be set to on ("1") or off ("0"). For testing disk drives, set to on.

Example: **f b 1**

r Remote; when set to "on", the logging information is sent to serial port 2 (ttyd2).

Example: **f r 1**

e Error mode; available error modes include continued after error, stop on error, or loop on error (used for bench testing).

Example: **f e 2**

v Verbose; used to enable (1) or disable (0) information messages. When enabled, system displays all information messages; when disabled, only error messages are displayed.

Example: **f v 0**

k Enable writes to the I/O devices. By default, this flag is set to off or 0 to protect customer data. Before enabling disk writes, you should check the **c**, **d**, **i**, and **t** flags. By default these flags should point to the swap partition.

Note: Before enabling the **k** flag and running the test, determine the location of the swap partition.

Example: **f k 1**

w Warning; default setting displays all warning and error messages. If disabled, system does not display warning or error messages.

Example: **f k 1**

a Automatically runs a suite of tests. These tests range from an individual board tests to overnight tests. For field service, use the field engineering tests. To display of list of possible test suites, at the DIAGS: prompt, enter **f a ?**.

d VME drives; selects the VME I/O device to be tested. By default, the IPI controller 0, device 0, partition 1 (swap) is selected.

Examples:

f d ipi(0,0,1)—IPI devices

f d xyl(0,0,1)—SMD devices

f d dkip(0,0,1)—ESDI devices

f d tpqic(0,0,1)—QIC tape devices

t SCSI drives; selects the SCSI I/O device to be tested. By default, the SCSI controller 0, device 1, partition 1 (swap) is selected.

Examples:

f t dksc(0,1,1)—SCSI disk

f t tpsc(0,1,0)—SCSI tape

i Selects the VME I/O devices to be tested by **mp** tests (must specify two devices). By default the IPI controller 0, device 0, partition 1 (swap), and the IPI controller 1, device 0, partition 1 (swap) are selected to be tested.

Examples:

i d ipi(0,0,1) ipi(1,0,1)

i d xyl(0,0,1) xyl(1,0,1)

i d dkip(0,0,1) dkip(1,0,1)

i d tpqic(0,0,1) dkip(0,0,1)

c Selects the SCSI I/O devices to be tested by **mp** tests (must specify two devices). By default the SCSI controller 0, device 1, partition 1 (swap) and controller 1, device 1, partition 1 (swap) are selected.

Examples:

f c dksc(0,1,1) dksc(1,1,1)

f c tpsc(0,1,0) dksc(0,1,1)

p Disables parity and ECC exceptions logic; allows bench technicians to look at memory errors without diagnostics stopping on errors. Not recommended for field use.

Using IDE to Test the System

The following procedure illustrates how to configure and execute a comprehensive IDE diagnostic.

1. Boot IDE.

   See page 3-24 for information about booting IDE.

2. Set the error test flag (e) to stop on the first error. At the DIAGS: prompt, enter

   ```
   f e 2
   ```

3. Set the flag states for VME I/O device (d) and VME I/O device for MP tests (i) to perform writes to the appropriate VME disk.

   a. Designate the d flag state for appropriate VME device:

      ESDI disk controller

      ```
      DIAGS:f d dkip(0,0,1)
      ```

      SMD disk controller

      ```
      DIAGS:f d xyl(0,0,1)
      ```

      IPI disk controller

      ```
      DIAGS:f d ipi(0,0,1)
      ```

   b. Designate the i flag state for the appropriate VME device (must name two devices):

      Examples:

      ```
      DIAGS:f i ipi(0,0,1) xyl(0,0,1)
      ```

      or

      ```
      DIAGS:f i dkip(0,0,1) dkip(1,0,1)
      ```

4. Set the flag states for SCSI I/O device (t) and SCSI I/O device for mp tests (c) to perform writes to the appropriate SCSI device.

   a. Designate the t flag state for appropriate SCSI device:

      ```
      DIAGS:f t dksc(0,1,1)
      ```

   b. Designate the c flag state for the appropriate SCSI device (must name two devices):

      Examples:

      ```
      DIAGS:f c dksc(0,1,1) dksc(1,1,1)
      ```

      or

      ```
      DIAGS:f c dksc(0,1,1) tpsc(1,2,0)
      ```

5. Enable the write mode for testing disk and tape drives. At the DIAGS: prompt,

   `f k 1`

Note: Write mode writes to disk only if you have configured the **d**, **i**, **t**, and **c** flag states to write to the swap partition. Data will be destroyed if the swap space on the designated device is not specified.

6. Set the a flag to run the FE tests. At the DIAGS: prompt, enter

   `f a 7`

7. Configure IDE to display on the system console. At the DIAGS: prompt, enter

   `f s 1`

8. Start system tests. At the DIAGS: prompt, enter **a**.

   The system displays the following warning:

```
Warning: Disk Write Mode is ON
         (some tests will write to disk partition 1)
         If you don't want to run these tests,
         please use "f k 0" to turn the Disk Write Mode off.
         Continue? (y/[n])
```

9. At this point, you have two options:

   a. If you are uncertain of the location of any of the swap partitions or have not set the **d**, **i**, **t**, and **c** flag states, enter **n**.

      Do the following:

      1. To disable the disk write flag, at the DIAGS: prompt, enter **f k 0**.

      2. To start the system test, enter **a**.

   b. If you have setup the **d**, **i**, **t**, and **c** flags to point to the swap partitions, enter **y** continue the test.

   As the tests run, the system displays messages. If all tests run without an error, the system displays a message saying tests have passed.

   If a test fails, the system will stop on that error. See the Troubleshooting (Section 4) for help determining the next course of action.

Running IDE Test Groups or Subtests

To run an IDE test group:

- At the DIAGS: prompt, enter

  `x testgroup`

  where *testgroup* is the name of the test group (see the **menu** command on page 3-25 for a list of test groups).

To run an IDE subtest:

- At the DIAGS: prompt, enter

  `x subtest`

  where *subtest* is the name of a subtest within a test group

  See the **menu** command on page 3-25 for a list of test groups. To displays a list of subtests for a test group, at the DIAGS: prompt, enter **m** *testgroup*.

To loop a test or subtest:

- At the DIAGS: prompt, enter

  `x test*n`

  where *n* equals the number of times to loop *test*.

Rebuilding the Kernel

If the system does not boot or if the booting process hangs, the problem may be caused by a corrupted kernel. Use the following procedure as a quick way to rebuild the kernel.

To rebuild the kernel:

1. Enter the Installation utility. At the System Maintenance Menu, enter **2**.

   System prompts you to select a media device and to install media.

2. Insert appropriate media into the selected media device.
3. Start the Administrative Command utility. At the Inst> prompt, enter **admin**.
4. Start a UNIX shell. At the Admin> prompt, enter **sh**.
5. Change to the */root* directory. At the # prompt, enter **cd root**.

   Note: When in the shell in the Administrative command utility, the */root* directory is the / directory when the system has booted and is running IRIX.

6. Rename the kernel. At the # prompt, enter **mv unix unix.copy**.
7. Exit the shell. At the # prompt, enter **exit**.
8. Exit the Administrative Command utility. At the admin> prompt, enter **exit**.

   The system executes the exit commands and displays various messages.

9. Restart the system. At the "Ready to restart the system. Restart?" prompt, enter **y**.

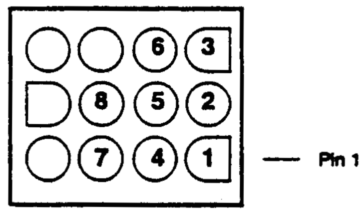
   Restarting the system causes a new kernel to be built. The system uses the new kernel to boot.

Testing Power Supply Voltages

Use a digital voltage meter (DVM) and the voltage test points on the system backplane to test power supply voltages for Crimson systems. Replace power supply if voltages are not within tolerances.

For testing voltages, use the following pin-out and orientation for the 12-pin Molex connector at location J4 on the system backplane (see page 2-8).

Warning: Systems produce a large current potential, which may be hazardous. Only trained service personnel should test power supply voltages.



Voltage	Pin	Tolerance
+5V	1	+/- 0.15V
-5.2V	6	+/- 0.15V
+12V	3	+/- 0.6V
-12V	4	+/- 0.6V
GND	2, 5, 7, or 8	N/A

To test the voltages on Crimson systems:

1. Shut down the operating system.
2. Turn off the power to the system.
3. Turn off the power circuit breaker, located on the back of the system.
4. On the system tower, remove the back cover panel and metal plate that covers the system backplane.
5. Locate the 12-pin Molex connector at location J4, near the bottom of the backplane (see Section 2, page 2-8 for component locations)
6. Locate the GND bus bar (top bus bar, covered with blue insulation) connections at locations J11 and J13 and the +5V bus bar (bottom bus bar) connections at locations J10 and J12.
7. Turn on the power circuit breaker.
8. Power-on the system.
9. Attach the DVM ground lead to the GND bus bar connections, locations J11 or J13, or to pin 8 of the connector at location J4 (both are ground points for the power supply).
10. To test the +5V, attach the DVM hot lead to +5V bus bar.

    The voltage should be +5V +/-.15 V.
11. To test the +12V, attach the DVM hot lead to pin 3 of the connector at location J3.

    The voltage should read +12V +/-.6V.
12. To test the -5.2 V, attach the DVM hot lead to pin 6 of the connector at location J3.

    The voltage should read -5.2 volts +/-.15V.
13. To test the -12V, attach the DVM hot lead to pin 4 of the connector at location J3.

    The voltage should read -12 volts +/-.6V.
14. When finished testing the voltages, turn off the power to the system.
15. If necessary, replace power supply.

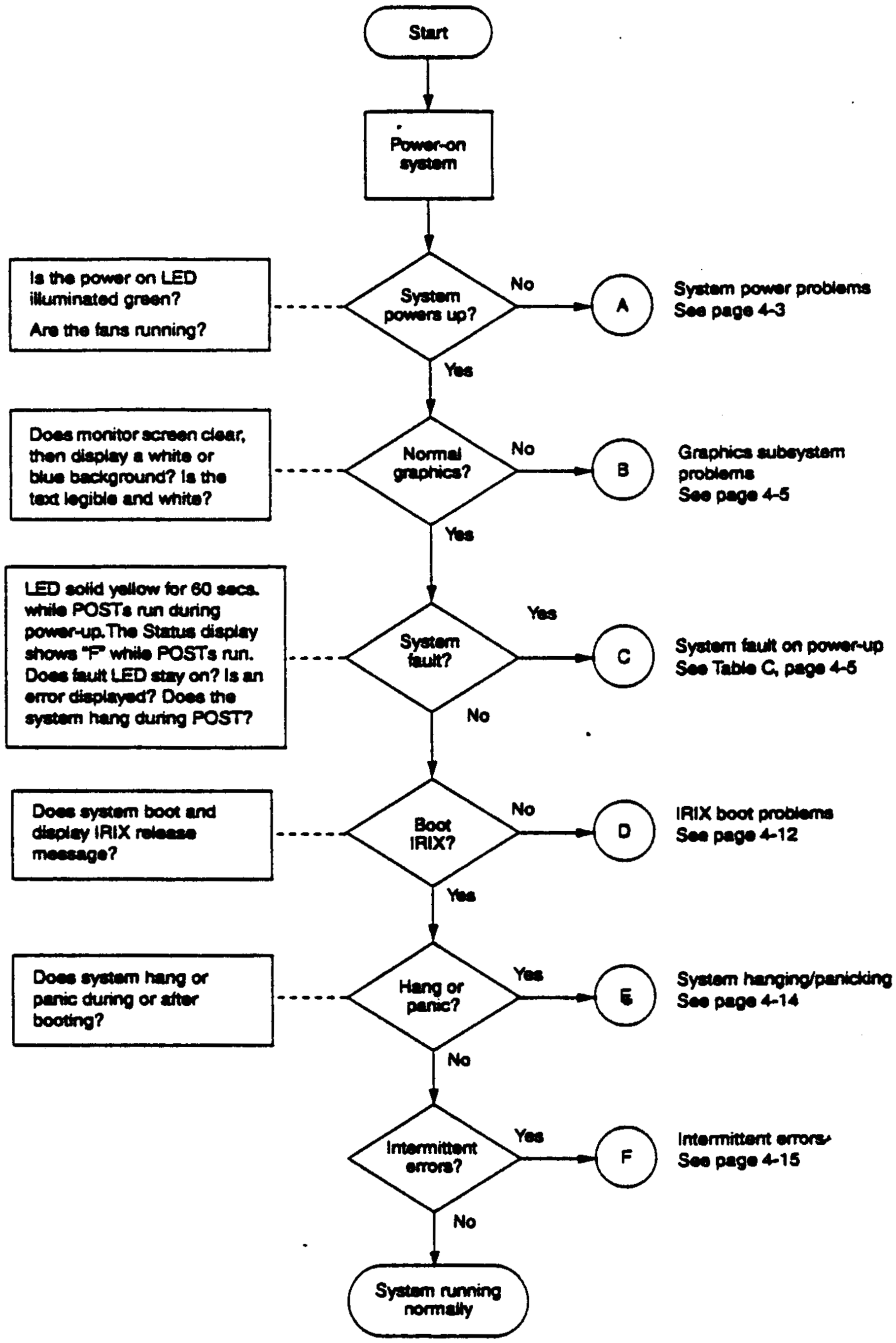
Section 4—Troubleshooting

This section contains the following flow charts for isolating failing field replaceable units (FRUs) on Crimson systems.

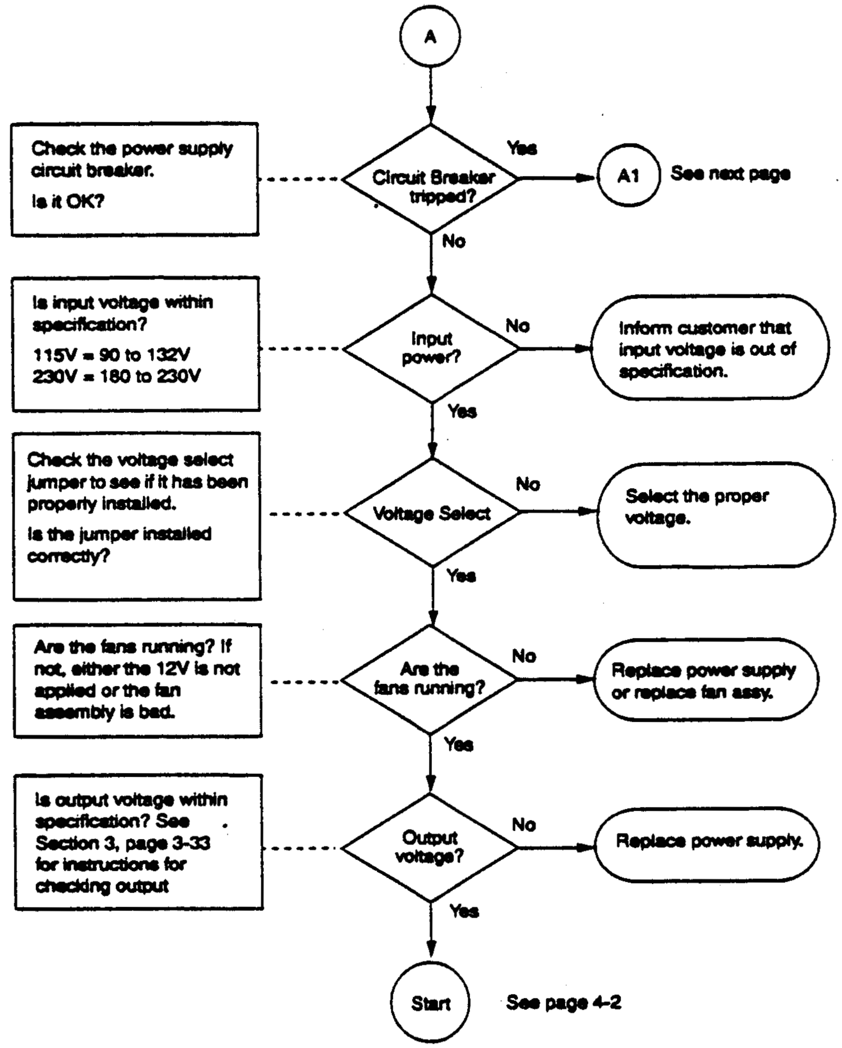
- System power problems
- Graphics problems
- System fault during power-on
- IRIX boot problems
- Hang or panic errors
- Intermittent errors
- Undetermined problems

Master Troubleshooting Flow Chart

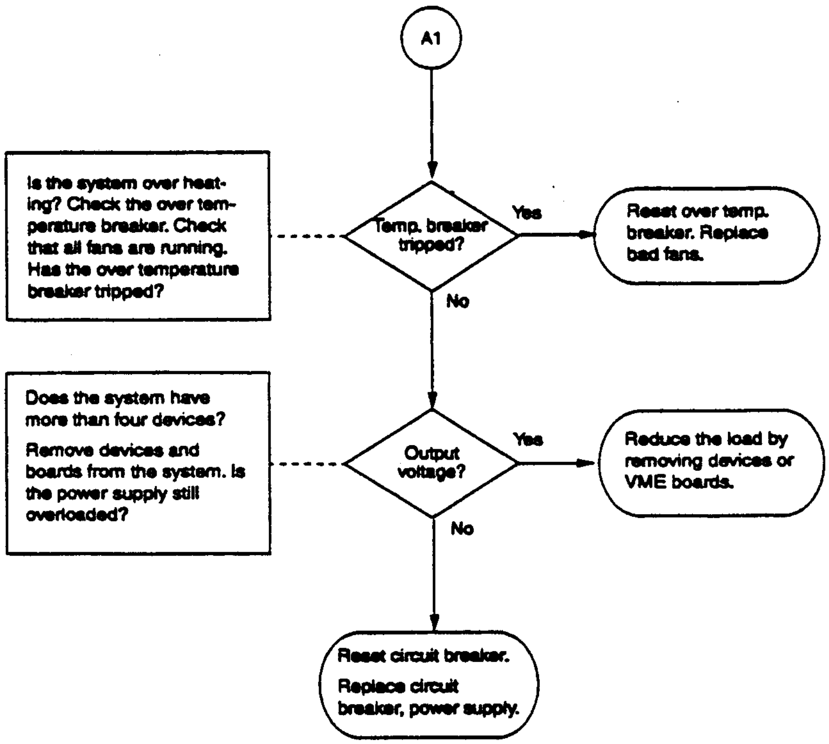
Depending on the specific type of error, the master flow chart will point to the appropriate flow chart and page number.



Flow Chart A—System Power Problems



Flow Chart A1—Over Heating Problems



Flow Chart B—Graphics Subsystem Problems

Boxes on the right side of the chart state possible problem areas and then list a set of test numbers. See Table B1 on the next page for troubleshooting procedures corresponding to test numbers.

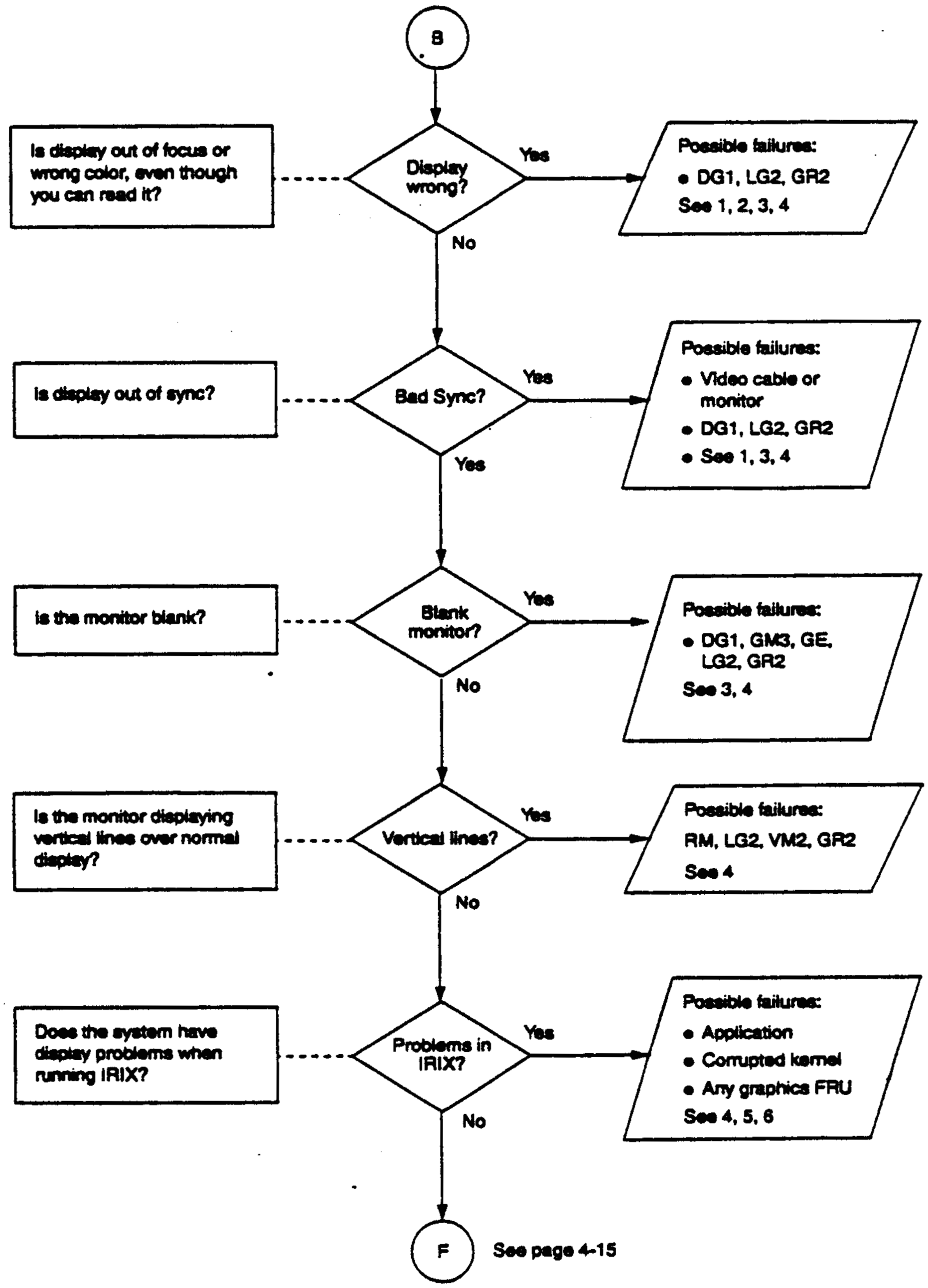


Table B1—Troubleshooting Graphics Subsystems Problems

Test	Procedure	Possible Failing FRU
1	• Check monitor cables • Rotate the RGB cables • Replace cables	Cables
2	• Check monitor termination, last device in video chain must be terminated	Operator error; bad termination
3	• Check monitor • Attach known-good monitor to system	Monitor
4	1. If graphics console is not functioning, force the console to the diagnostics port (See Section 3, page 3-6) 2. On VGXT subsystems, connect the ASCII terminal to the diagnostics port on the GM3 and power cycle the system. Look for graphics POST failures. 3. Check Graphics boards LEDs. See Section 2 for normal LED patterns.	Any board in graphics subsystem
5	• Run the graphics demos or customer's application	Graphics or CPU board
6	• Reinstall IRIX	Bad file system

Flow Chart C—POST Fails

Boxes on the right side of the chart state possible failing FRUs and point you to additional troubleshooting procedures. See Table C1 on the next page for a list of POST failure messages corresponding to failed FRUs.

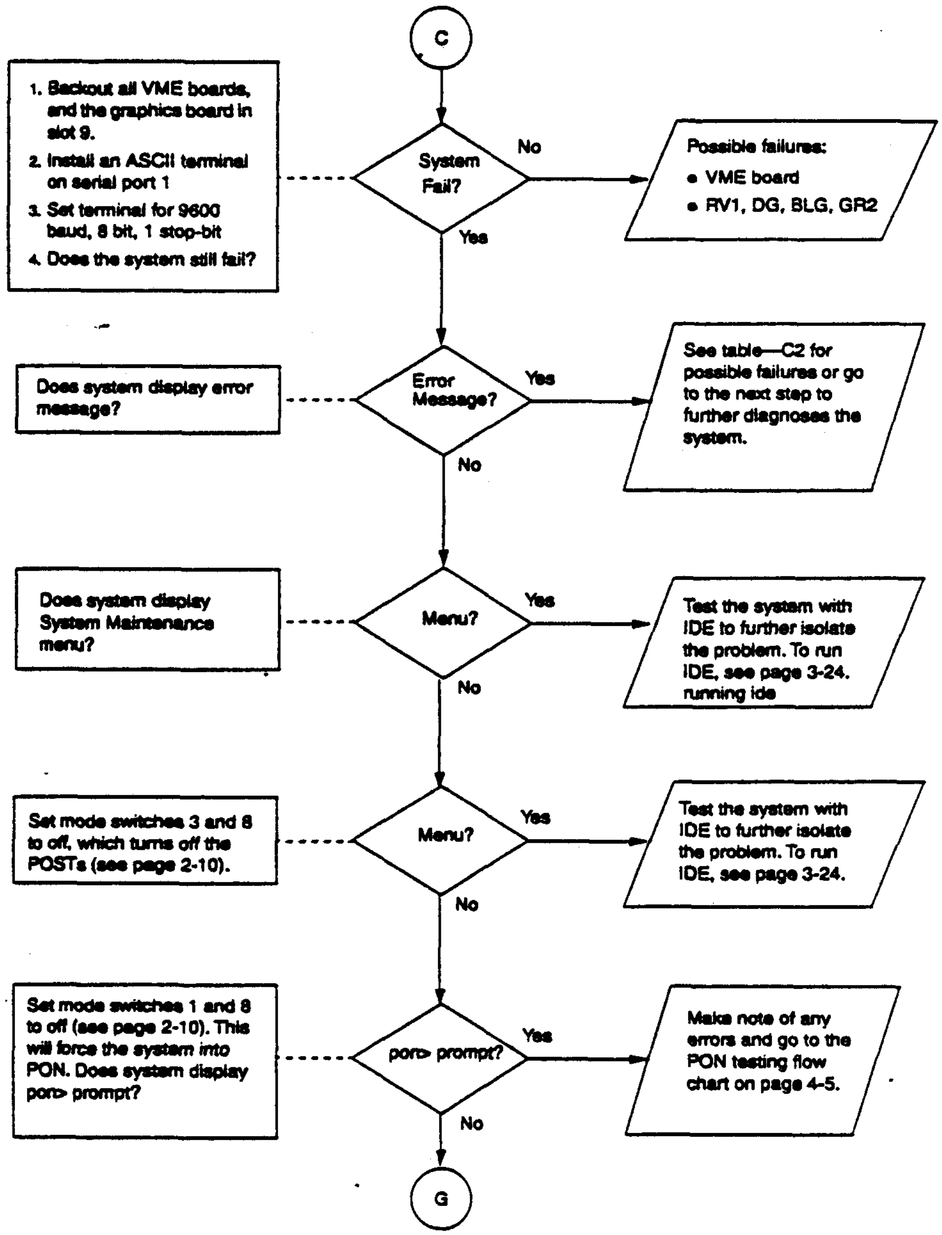


Table C1—System Fails POSTs

When a failure occurs during the POSTs, the system displays error information on the graphic console and an ASCII terminal connected to the diagnostics port (serial port 1); system displays error message indicating the test that failed.

See the table below for decoding the diagnostic messages.

POST Message	Failing FRU
Memory address test	Group 1 SIMMs, CPU board
Sizing Caches test failed	CPU, IO3B, Group 1 SIMMs
UART test failed	CPU board
Timer/clock test failed	CPU board
Floating point unit test failed	CPU board
Sync bus controller test failed	CPU board
I/O mapper, INT vectors test failed	CPU, IO3B board
SCSI controller test failed	IO3B board
System bus test failed	CPU, IO3B, or backplane
Caches test failed	CPU board
Full memory test failed	SIMMs, CPU board
Memory size worn	SIMMs, CPU board

By-Passing the POSTs

If the system hangs during the POST, the mode switches located on the status panel board can be set to bypass the POSTs. After bypassing the POSTs, run IDE to isolate the cause of the failing POST (see Section 3, page 3-24).

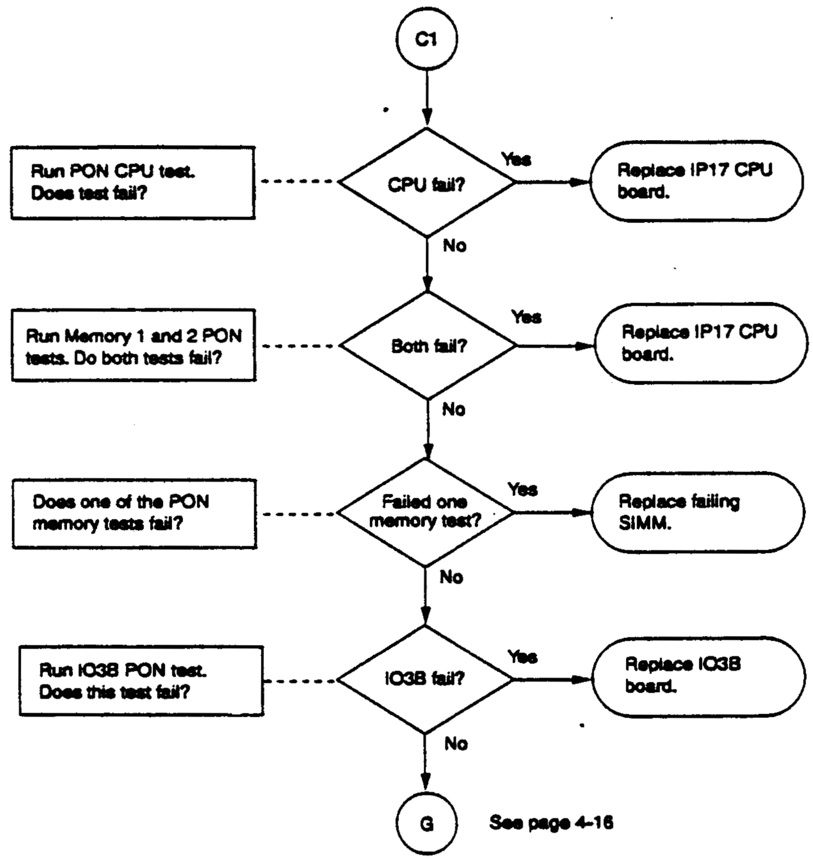
To by-pass the POSTs:

1. Locate the mode DIP switches on PS3 status panel (see Section 2, page 2-10)
2. Set switches 3 and 8 to the "OFF" position.
3. Power cycle or reset the system.

   The system will by-pass the POSTs and display the System Maintenance menu.

Flow Chart C1—PON Testing

Power-on (PON) testing is low level hardware testing, using firmware in NVRAMs residing on the CPU board and IO board. Use the following chart to help you determine the most probable failing board. See the next page for information about running PON tests.



Running PON Tests

See the table below for descriptions about running PON tests.

PON test	Test commands
CPU—Test CPU caches	pon>**ww 80000000 aaaaaaaa<Return></><Return>** pon>**dw 80000000<Return></><Return>** The system should display "aaaaaaaa"
IO3B—Write to memory using the IO3B	pon>**ww a0023000 ffffffff <Return></><Return>** pon>**ww a0023000 0000 <Return></><Return>** pon>**dw a0023000 <Return></><Return>** The system should display "0000ffff"
Memory1—Test low memory	pon>**mem a0000000 a0400000 <Return>** Tests the first 4MB of memory, which is needed to run IDE.
Memory2—Test high memory	pon>**mem a0f00000 a0f14000 <Return>** Test the first 80 KB of the16th megabyte of memory

Note: In the above procedures, the notation "**<Return></><Return>**" specifies three separate key strokes:

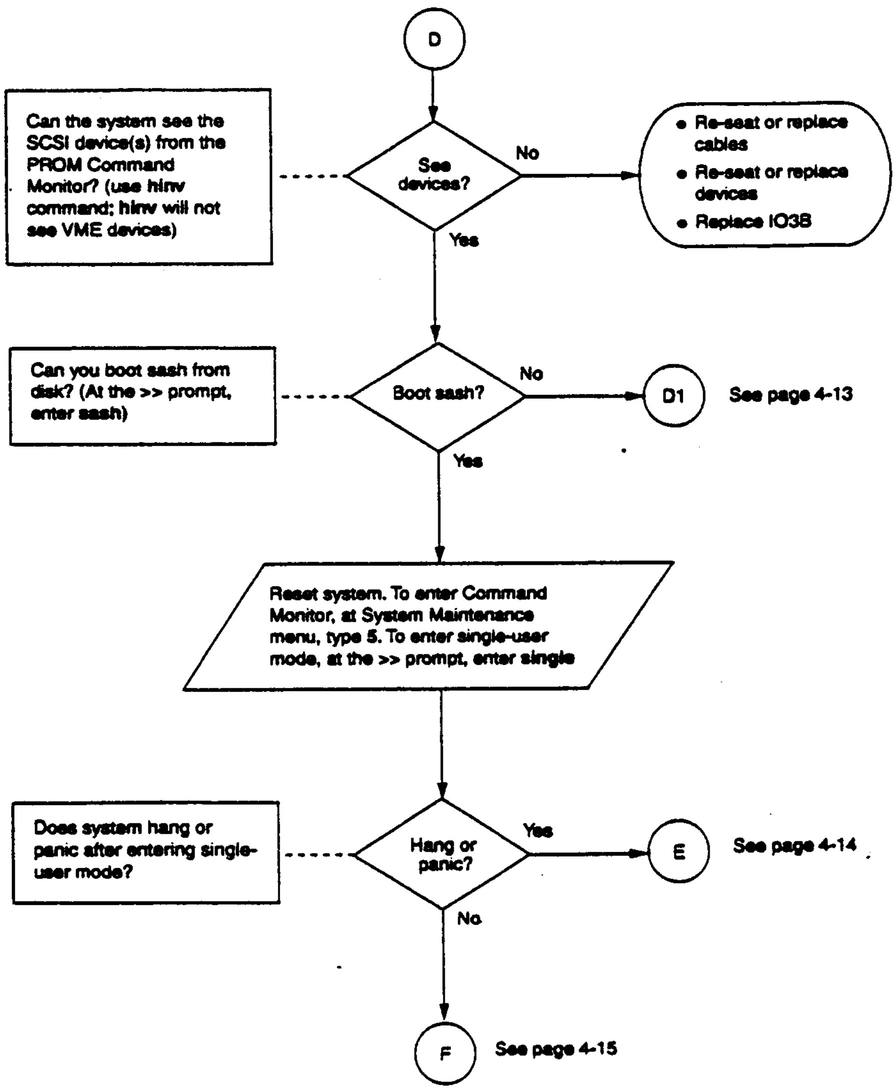
1. Press **<Return>**.
2. Press the **</>** key.
3. Press **<Return>**.

Flow Chart D—IRIX Boot Problems

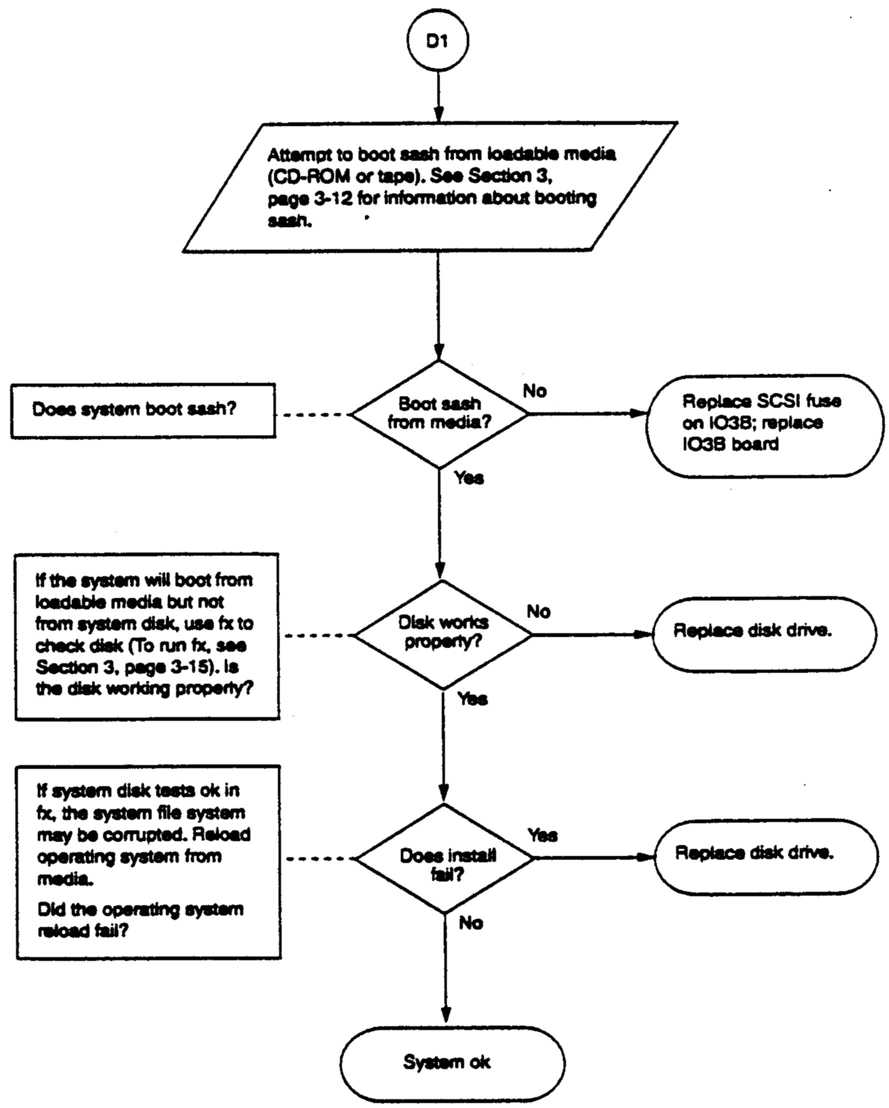
Problems with the following can result in the system not booting:

- CPU
- Memory
- System disk drive
- Standalone shell (sash)
- Corrupted file system

Note: Before proceeding with the flow chart below, re-seat all cables, boards, and devices.

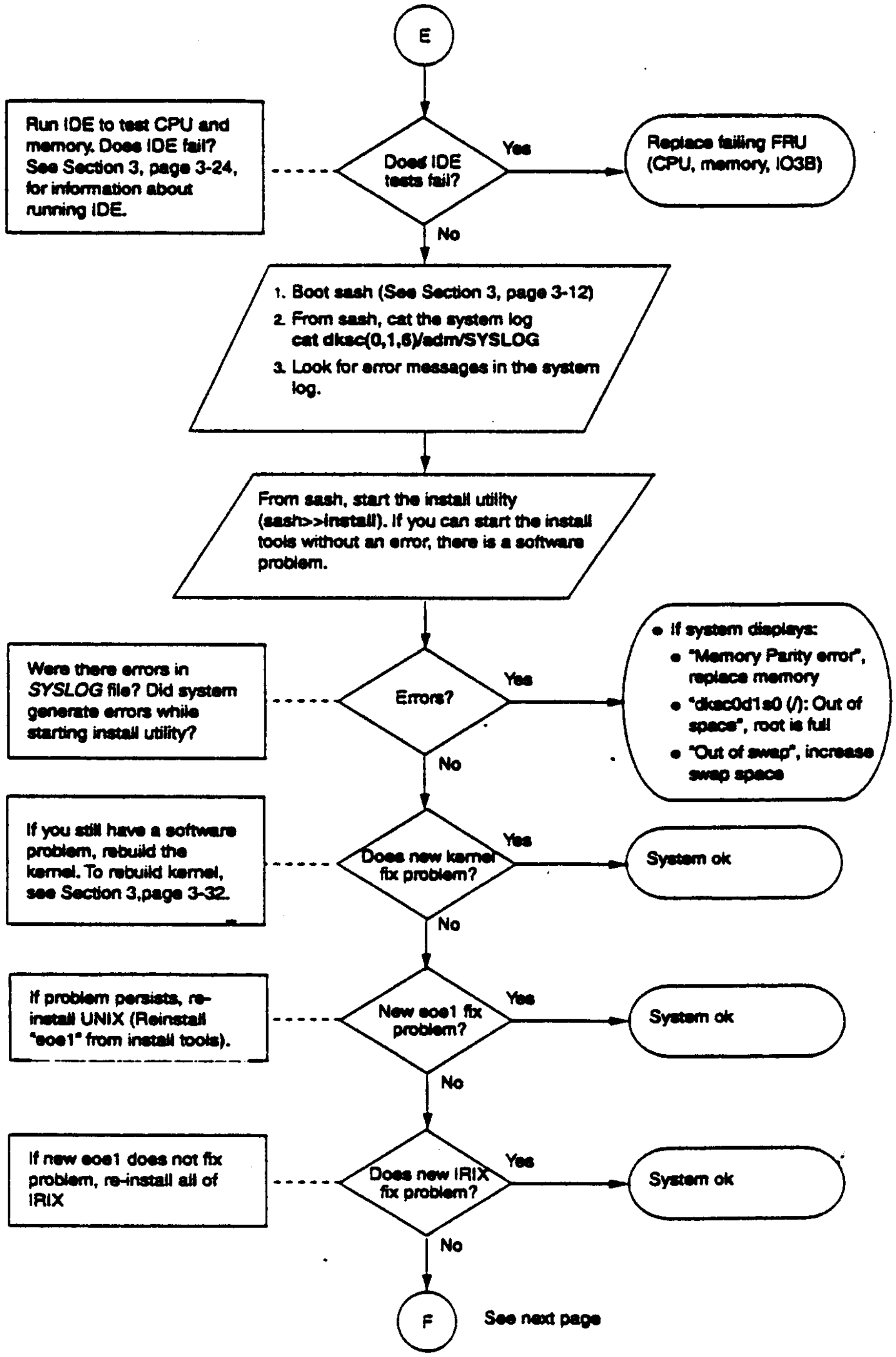


Flow Chart D1—System Cannot Boot sash From System Disk

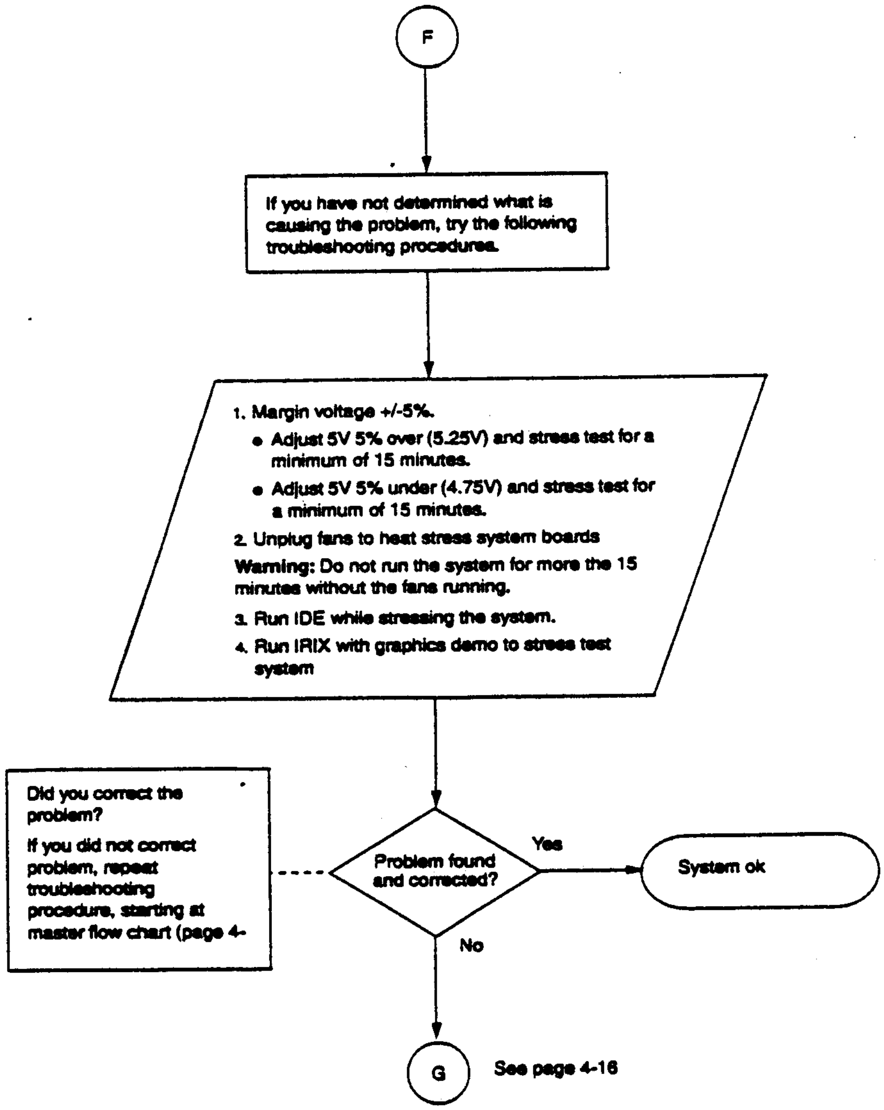


Flow Chart E—System Hangs or Panics

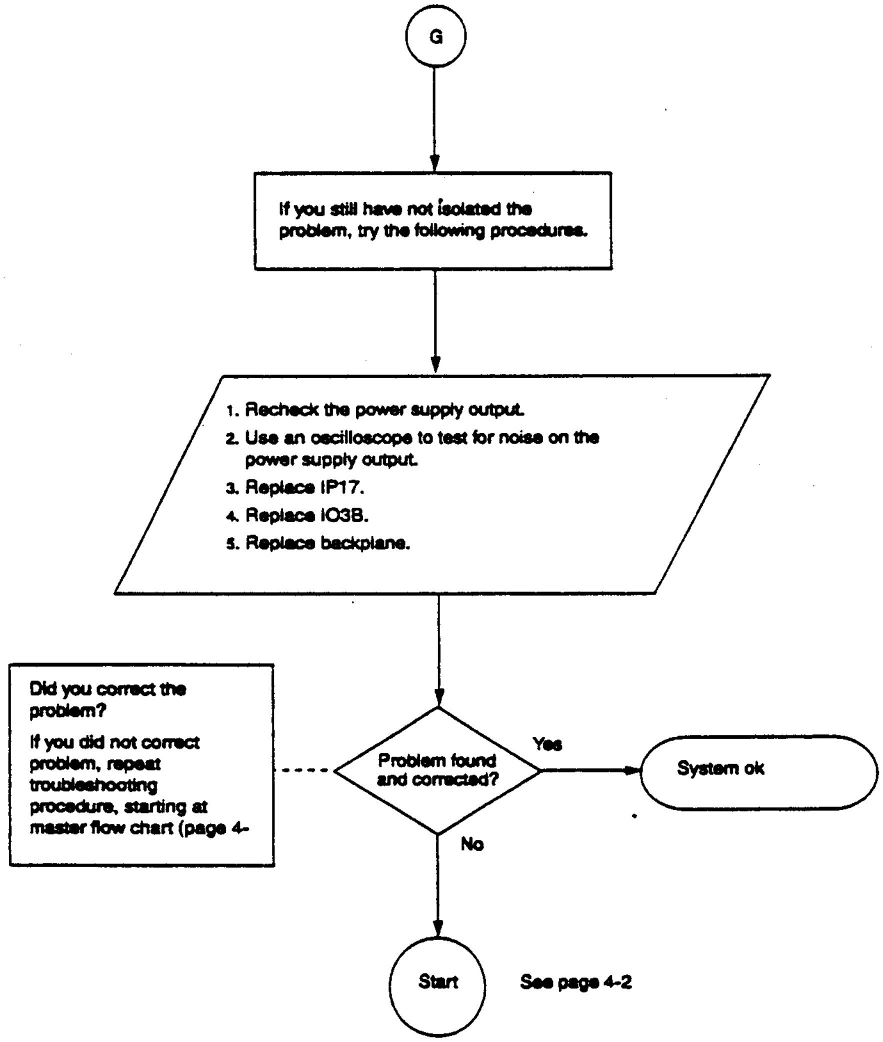
Use chart to troubleshoot a system that will not boot single or multi-user IRIX.



Flow Chart F—Intermittent Problems



Flow Chart G—Undetermined Problems



Section 5—Field Replaceable Units

This section contains a list of field replaceable units (FRUs) for Crimson systems. Also included is a description of SGI's part numbering nomenclature.

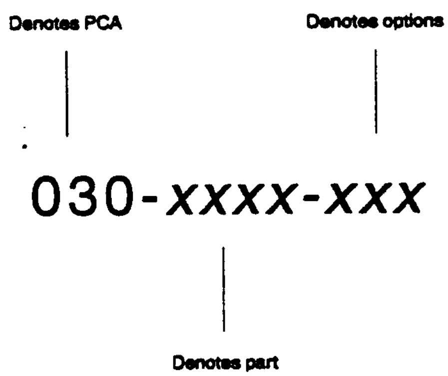
Part Number Nomenclature

SGI's part numbers identify four types of basic system components.

- Printed circuit assemblies (PCAs)
- Peripheral devices (usually third-party)
- Assemblies
- Cable Assemblies

Printed Circuit Assemblies

Part numbers for printed circuit assemblies (PCAs) such as CPU boards (without daughter cards), daughter cards, I/O boards, memory boards, graphic subsystem components, and SIMM modules or other basic circuit board take the following format:



For basic PCAs, the first three digits are "030." The second four digits are unique to the particular part and rarely change. The last three digits usually denote options or revision levels and will change during the part's life cycle.

Peripheral Devices

Peripheral devices such as raw disk drives (without brackets or sled), tape drives, CD-ROM drives, power supplies, and monitors purchased by SGI and then configured into systems are identified by a seven-digit number beginning with "9".

9*xxxxxx*

This seven-digit number is different from the manufacturer's part number.

Assemblies

PCAs or peripheral devices configured together or configured with additional parts such as mounting brackets or cables are called assemblies ("ASSY" in part descriptions). Assemblies are identified by a part number that is completely different from the individual PCAs or peripheral devices that comprise an assembly.

Part numbers for assemblies take the following format:

Denotes assembly — Denotes options

013-*xxxx*-*xxx*

Denotes part

An assembly part number is similar to a PCA part number except that the first three digits are "013". Assemblies include CPU boards with daughter cards, entire graphics subsystems, and disk and tape drives with sleds and cables.

Cable Assemblies

Part numbers for cable assemblies such as power harnesses, video cables, and SCSI cables begin with "018".

FRU List—Crimson

CPU—Memory—IO

FRU Number	Description
030-0222-00x	PCA IO3B I/O CONTROLLER
030-0236-00x	PCA IP17 100 MHZ R4000 CPU
030-0512-00x	PCA IP17 150 MHZ R4400 CPU
030-0133-001	PCA SM1 SIMM 2MB 80NS
030-0184-002	PCA SM2 SIMM 8MB 80NS

VGXT Graphics Subsystem

FRU Number	Description
030-0218-00x	PCA DG1 DISPLAY GENERATOR
030-0153-00x	PCA GE6 GEOMETRY ENGINE
030-0155-001	PCA GI3 EDGE CONNECTOR
030-0213-00x	PCA GM3 GRAPHICS MANAGER
030-0382-00x	PCA GM3 GRAPHICS MANAGER
030-0160-001	PCA RI5 EDGE CONNECTOR
030-0220-001	PCA RM3 RASTER MANAGER

Reality Engine Graphics Subsystem

FRU Number	Description
030-0223-01x	PCA DG2 DISPLAY GENERATOR
030-0233-001	PCA DI1 EDGE CONNECTOR
030-0225-003	PCA GE8 GEOMETRY ENGINE
030-0224-004	PCA RM4 RASTER MANAGER
030-0360-001	PCA RM4T RASTER MANAGER TERMINATED

Single-Board Graphics Subsystems

FRU Number	Description
013-0493-00x	PCA ASSY BASIC LEVEL GRAPHICS
013-0495-00x	PCA XS GRAPHICS
013-0496-00x	PCA ASSY XS24 GRAPHICS
013-0494-00x	PCA ASSY ELAN GRAPHICS
013-0675-001	PCA ASSY EXTREME
030-0248-003	PCA MG1 ADAPTER
030-8117-001	PCA GR2 w/ 1GE7s GRAPHICS MOTHERBOARD
030-8058-006	PCA GR2 w/ 4GE7s GRAPHICS MOTHERBOARD
030-8112-00x	PCA IEV1 GALILEO VIDEO
030-8077-00x	PCA LG2 BASIC LEVEL GRAPHICS BOARD
030-8094-00x	PCA LG2X2 DUAL-HEAD BASIC LEVEL
030-8095-00x	PCA SRV1 INDIGO VIDEO
030-8093-00x	PCA VB1.1 VIDEO BOARD
030-8059-00x	PCA VM2 VIDEO MEMORY MODULE
030-8105-004	PCA VB2 VIDEO BOARD
030-8060-00x	PCA ZB4 Z-BUFFER CARD
030-8106-004	PCA GU1 GRAPHIC BOARD
030-8107-002	PCA RU1 RASTER BOARD

Drives

FRU Number	Description
9410101	DRIVE DISK 1.0GB SCSI 3.5"
013-0570-001	DRIVE DISK ASSY 1.0GB SCSI 3.5" w/ SLED
041-0062-001	DRIVE DISK 1.0GB SCSI-2 3.5"
013-0571-001	DRIVE DISK ASSY 2.4GB SCSI 5.25" w/ SLED
9410819	DRIVE CDROM 600MB 5.25" SCSI EXTERNAL
9410040	DRIVE CDROM 600MB 5.25" SCSI INT.
050-8055-001	DRIVE CDROM 600MB 5.25" SCSI INT. w/ CADDY
041-0011-001	DRIVE TAPE 5.0GB 8mm SCSI 5.25" FH
041-0009-001	DRIVE TAPE 1.3GB SCSI DAT 3.5"

Controllers

FRU Number	Description
013-0208-002	PCA ASSY CONTROLLER 6 PORT SERIAL
013-7062-002	PCA ASSY ETHERNET HIGH SPEED

Keyboard/Mouse

FRU Number	Description
9150800	MOUSE ALPS (MECHANICAL)
9500801	KEYBOARD ALPS (FOR MECHANICAL MOUSE)
021-0006-00x	KEYBOARD (FOR OPTICAL MOUSE)
021-0004-00x	OPTICAL MOUSE

Monitors

FRU Number	Description
9330040	MONITOR 16" SONY BNC DUAL SCAN
9330041	MONITOR 19" SONY 13W3 DUAL SCAN
9330042	MONITOR 19" HI RES BNC
9330043	MONITOR 19" HI RES BNC
9330812	MONITOR 19" MITSUBISHI AUTO SCAN 13W3
9330818	MONITOR 19" SONY AUTO SCAN 13W3

Chassis

FRU Number	Description
013-0197-00x	BACKPLANE ASSY BP14D (14 SLOT)
030-0182-00x	PCA I/O PANEL PP2
9430021	POWER SUPPLY 1050W
013-0390-003	POWER SUPPLY ASSY 1050W W/ FANS
013-0392-002	STATUS PANEL ASSY II (PS3)
013-0353-00x	FAN MODULE
013-0564-001	FAN TRAY ASSY 6 FANS
9400047	FAN CONTROLLER
9110035	THERMAL SENSOR

Cables

FRU Number	Description
018-0136-001	CBL ASSY CPU TO I/O
018-0285-001	CBL ASSY EXT 13W3 TO 13W3 15'
018-0286-001	CBL ASSY EXT 13W3 TO BNC 25'
018-0179-002	CBL ASSY EXT SCSI 10.5'
018-0268-001	CBL ASSY EXT SCSI DB50 to CENTRONICS
018-0082-001	CBL ASSY INT CONTROL
018-0088-001	CBL ASSY INT ETHERNET
018-0075-001	CBL KEYBOARD EXTENSION
018-0075-002	CBL KEYBOARD EXTENSION 15'
018-0189-001	CBL VIDEO INT